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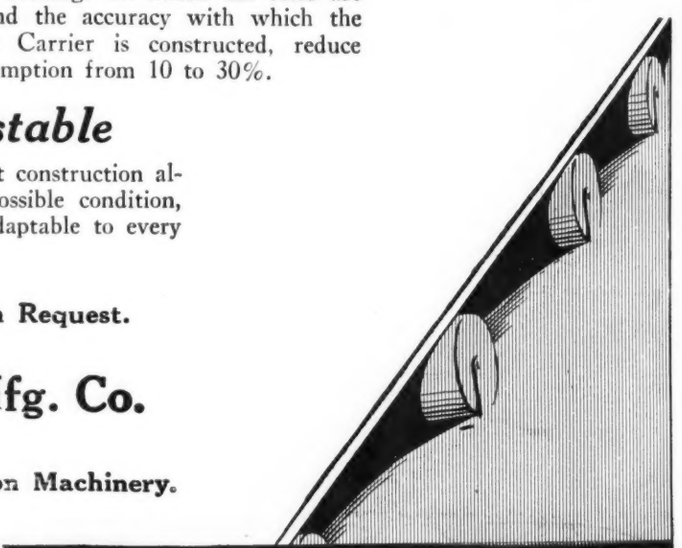

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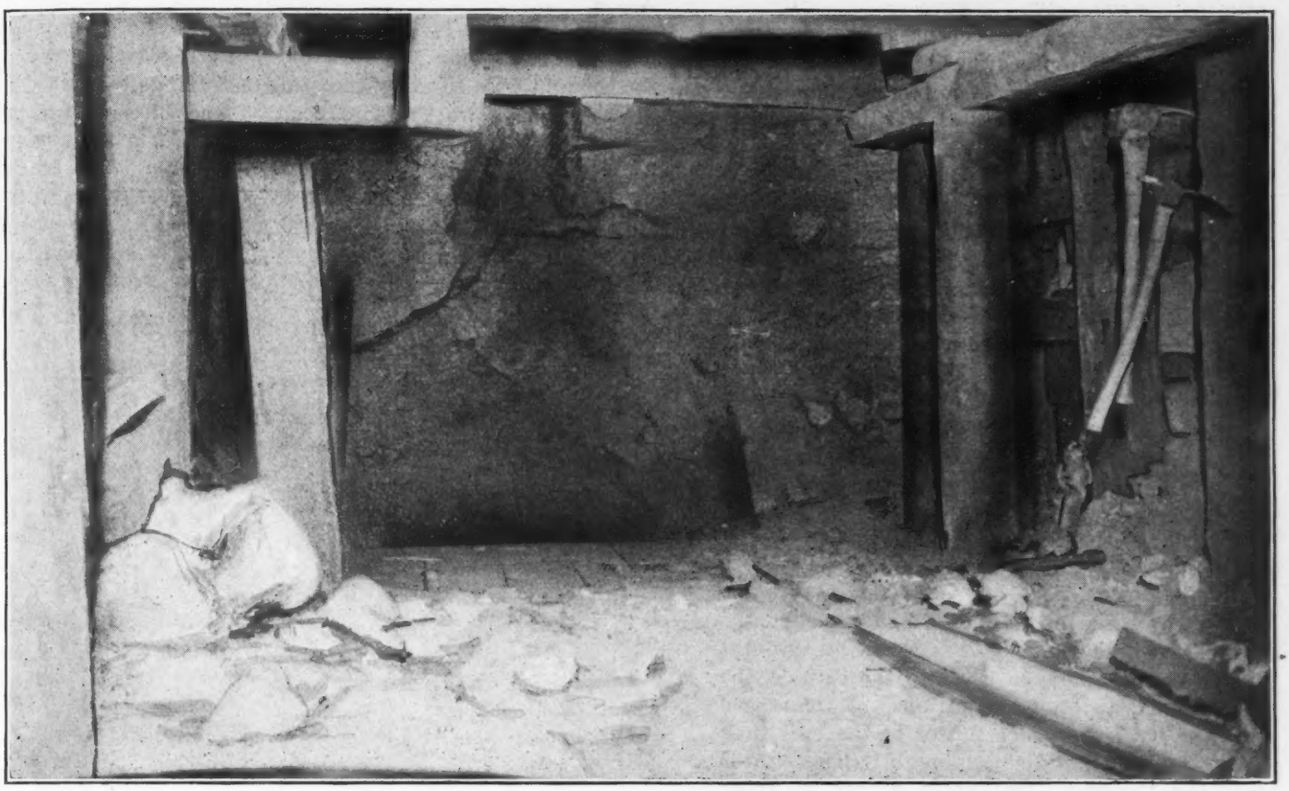

VIEW OF A WORKING OPPOSITE CAVED STOPE IN THE HECLA MINE

Recovering Caved Stopes in Narrow Veins—III*

BY C. T. RICE

A stope 30 ft. wide caved for a length of 90 ft. along the vein and to a height of 75 ft. The ore in the cave was confined to a strip 10 ft. along the hanging wall, the other 20 ft. being mainly barren quartzite. Recovery of a cribbed chute buried under the center of the pile of barren vein matter was necessary in order to stope the ground above the cave economically. By carrying trenches down, a floor at a time, both along the hanging wall and across the center of the pile, using spiling to hold back the loose rock, the ore was removed and the cribbed chute recovered with a minimum of labor and without accident, although the trenches had to be carried down eight floors, or about 70 ft., through the caved material. The method described is safe and expeditious.

THE most difficult problem in handling caved ground which has as yet presented itself at the Hecla mine was that of reopening the stope which caved several years ago between No. 4 and 6 chutes of the 900-ft. level. This stope had been carried up a few sets above the tramming tracks on the 14th floor, when the back for a distance of about 90 ft. along the vein suddenly gave way and took out everything before it down to the tramming floor. The stope was 30 ft. wide, although at the time practically all the ore was confined to a 10-ft. strip next to the hanging wall. The ground, furthermore, was broken up by a number of minor slickensides. As a result, the stope continued to cave until the back had reached a point about 75 ft. above the 14th floor, as shown in Fig. 1.

A trench cut across the caved material from wall to wall showed that in this ground, before the accident occurred, the ore had been confined almost entirely to the 10 ft. next the hanging wall, as was the case lower down, and that, in caving, little of it had become mixed

*Continued from Part II, July 6, 1918, which followed Part I, June 15. 1918. This paper completes the series.

with barren vein filling. In no place throughout the other 20 ft. of the pile was it thought that there was enough ore to make its recovery worth while. The real problem, however, in reopening this stope was not to get the ore, but to recover, at a reasonable cost, No. 5 cribbed chute, which was buried under the center of the pile of barren vein filling, and was needed in order to mine the ore above the cave economically.

The plan adopted in reopening the working was to catch the back up securely over the caved area, and then, beginning at the top, to remove the ore by trenching along the hanging wall, timbering this opening with drift sets and using spiling to hold back the barren quartzite on the foot-wall side of the cave. Then, when this hanging-wall trench was even with the top of No. 5 chute, a trench 15 ft. wide was cut from wall to wall across the pile. Spliced stulls, slightly trussed and tied together into stull sets, were used to hold this central trench open, the broken vein matter along the sides being kept from moving by driving spiling down until new stull sets could be put in below. Thus proceeding carefully, a floor at a time, these two trenches were carried down through the caved vein, filling a distance of eight floors, or approximately 70 ft., without setting the pile in motion and without serious accident.

Stope Reopened From East End

A large open space had been left at the top of the cave, and as the stope had been worked two floors higher at the west than at the east end, it was possible to get into the cave at the former end, to study conditions. It was seen that the back was much flatter at the east than at the west end, and so, although it necessitated carrying the stope two floors higher in order to bring it even with the top of the cave, it was decided to reopen the working by trenching in from the east end. Consequently, the ore between No. 6 chute and the cave, and the much longer block of ground between it and the waste raise at the east end of the working, were stoped out even with the top of the cave. Stull sets were used to hold the ground open. But as many large slabs and boulders were scattered through the caved material, the end of the stope next to the cave did not have to be lagged to hold back the loose filling as the stope was carried up.

It was necessary to keep open the ground between No. 6 chute and the cave, in order to use that chute in reopening the cave, and fortunately this opening was only a few sets long. But the last part of the stope between No. 6 chute and the waste raise was lagged off and then filled tightly with waste to within two floors of the back, so that no more ground would be open in the vicinity of the cave than was absolutely necessary. The waste for filling this part of the stope was trammed from the waste raise at its east end, and later the tracks were extended into the cave when it became necessary to fill the central and hanging-wall trenches.

The first thing to be done in the cave proper was to catch up the back temporarily with sprags and posts, until the rather heavy flat part at the east end could be timbered securely with trussed stulls. These sprags and posts were stood on top of the pile with head- and footboards. Then, when the back had been picked down carefully, the work of placing the spliced stulls under the flatter part of the back began. As the west end of the cave had arched itself up rather securely, these stulls were necessary only a little more than half way.

Even under the flatter part of the back, the open space over the pile of caved material varied greatly in height, sometimes 10 to 12 ft. and again only 3 or 4 ft., according to the way in which the boulders and large slabs were scattered. Because of this irregularity, it was thought best to carry the stulls on stringers while they were being worked into position and blocked, for the stulls which were spliced together to form the trusses were green timbers 15 ft. long and from 14 to 18. in. in diameter, and so were heavy. Moreover, by carrying the stulls in this way, it was certain that they would be put in properly and at an even height—an advantage when stoping was resumed in the ground above.

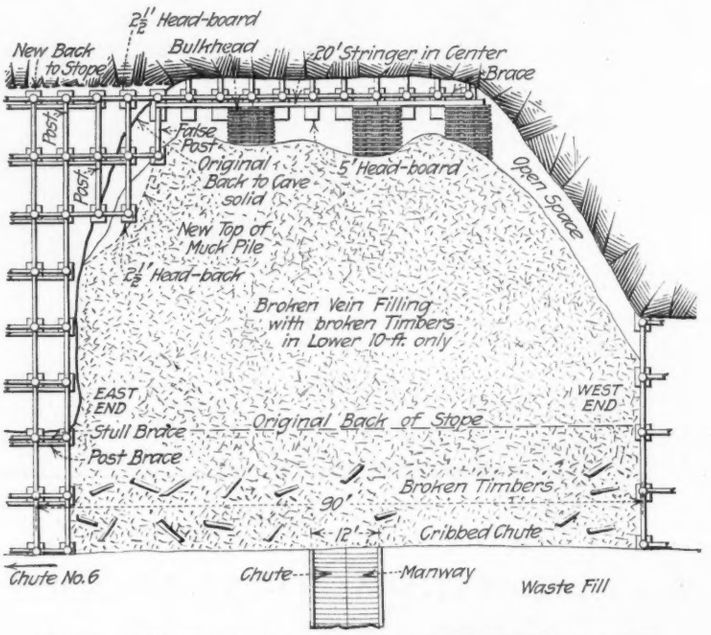

FIG. 1. LONGITUDINAL SECTION OF STOPE THAT CAVED ABOVE THE 900-FT. LEVEL, BETWEEN CHUTES NOS. 4 AND 6, FOR A HEIGHT OF 75 FEET

The full importance of trussing spliced stulls at a greater angle was not understood at the Hecla mine at that time, and so the center stringers were put in only about 12 in. higher than those along the walls. These stringers were round timbers, 16 ft. long and slabbed off on their upper and under sides to 8-in. faces. Four of them were placed in the stope, one near each end of the stulls that were to be trussed together. These catching-up stulls were put in beginning at the east end of the stope. In working ahead, the temporary sprags and posts were removed when necessary to get the stulls in properly.

The eastern ends of the first stringers were carried on false posts from the stull caps of the top floor of the east stope, and were wedged down on these posts securely from the stull cap above, so that they would not be displaced while the new stulls were being worked into position on them. The outer or cave ends of these four stringers were carried at their proper height by cribs from the pile. These cribs were built of 3-in. planks 5 ft. long, with three planks put in to a course,

and were positioned, as shown in Figs. 1 and 2, so that they would catch the inner ends of the next stringers as well as the outer ends of the first ones. When the center of the cave was reached, care was taken to place the cribs so that they would not interfere with the sinking of the trench that was to be carried down to uncover No. 5 cribbed chute.

Stringers Carry Top Weight Until It Nips Stulls

As soon as the first four stringers were ready, three pairs of stulls were positioned on them at 5-ft. centers from the stull sets of the stope. Headboards three deep, of 3-in. planks, 5 ft. long, were then placed be-

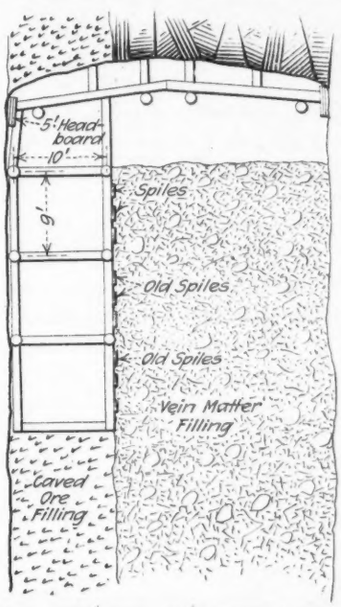

FIG. 2. CROSS SECTION OF CAVED STOPE SHOWING STULL SUPPORT UNDER BACK AND THREE FLOORS OF SPILED DRIFT

tween their ends and the walls, and sufficient blocking was put in over the splices to catch up the back. Spreaders were put in to keep the stulls from swinging sideways, and the several trusses finally wedged tightly in place by driving home the wedges in the headboards.

As soon as the back had been caught up securely from these first three trusses, cribs were built to carry the next four stringers, three other pairs of trussed stulls were put in, and the back was again securely caught up from them. Thus, working ahead three stulls at a time, the back was caught up for a distance of about 50 ft. over the east end of the cave. At that point the top of the cave began to arch itself both crossways and longitudinally along the vein, so that only an occasional post or sprag was required to make it perfectly safe. In putting in the cribs on the hanging-wall side of the cave, care was taken to place them in such a way that they could be caught up easily from below when the ore along that side was being trenched out, for it was highly important to keep these cribs in until the top weight had seated the stulls and their headboards securely against the rough walls of the cave, as until then most of the top weight coming on the trusses had to be carried by the stringers.

Occasionally the back ran up so high that short posts, or even false sets, had to be placed on top of these catching-up trusses to make the back secure. But generally that was unnecessary, as the back of the cave, although 30 ft. wide and rather flat at the east end, had caved until it was in fairly strong ground.

Starting at the top and east end of the pile, a trench was cut along the hanging wall, wide enough to get out all the ore. This was then timbered with drift sets having 10-ft. caps and 8-ft. posts, put in at 5-ft. centers. Mud sills were placed under these sets, which later became the caps of the drift sets on the next floor below. In cutting this trench, spiling had to be driven on the cave side, as already stated, so as to hold back the barren vein filling. But as many large slabs were scattered through the pile, and the quartzite of the vein had, as a whole, broken into rather coarse pieces, the spiles, which were nothing but 3-in. planks, 9 ft. long, that had been beveled somewhat at one end, did not have to be placed close together, and generally were driven from 12 to 18 in. apart. Bridge pieces, therefore, were unnecessary for catching the ends of the spiles, when the set ahead was put in, as sufficient room was always left between them for starting new spiles, even when the weight had forced the spiling in tightly against the posts.

As soon as the hanging-wall trench, which was 9 ft., or a floor, deep, had advanced far enough, the trench 15 ft. wide, previously mentioned, for uncovering No. 5 cribbed chute, was started across the pile and carried 9 ft. deep from wall to wall. The drift sets were placed in the hanging-wall trench as fast as it was advanced. In making room for the sets, no trouble was caused by ore running in the face, and breast-boards were found unnecessary, as the ore had broken rather coarsely, and would not run enough to undermine more than one mud sill at a time. As the sills of the different sets were securely tied together by means of braces when they were put in, the catching up of the timbers on the floor above was comparatively easy, the only thing needful being to put in two angle braces from the last mud sill on the lower floor to carry the mud sill of the set ahead on the floor above before it was undermined. These angle braces were placed so as to come just inside the posts that were to be put under the sill, converting it into a cap. Then, as soon as the ground had been worked out from under the set above, two posts and a mud sill would be positioned properly under it, braces put in to tie this mud sill to the mud sill of the last set, and the set finally blocked up tightly in place from beneath so as not to permit the timbers above to settle when the slice below was carried further ahead.

Central Trench Timbered by Slightly Trussed Stull Sets

In the central trench, the caved vein filling had to be held back, as well as the walls kept open. This was done, as shown in Figs. 3 and 4, by means of stull sets and spiling driven down along their sides. As soon as the central trench had been dug deep enough to get in two floors of stull sets below the catching-up stulls above the trench, driving of the side spiling in the central trench was begun.

As the spliced stulls were put in at 9-ft. centers vertically from one another, longer and stronger spiling had to be used than in the hanging-wall trench. So they were made by beveling off at one end round timbers

about 8 in. in diameter that had been ripped in half. These did not have to be placed closely together, owing to the general coarseness of the rock in the pile. Furthermore, as the caved vein filling had little tendency to run, they were not driven down level with the stulls of the floor below. Neither was it so hard to work these spiles in as might be thought, owing to the coarseness of the caved material, for round spiling drives more easily than flat spiling.

Some trouble was caused by boulders in driving the spiling, both in the hanging wall and in the central trench, but not much, except when one came in the way of the next set or stull, as the boulder, caught securely in the pile, would hold the loose ground back as well as spiling would. When the boulder could not be worked out of the pile without too much danger of causing the muck to run, or when so much of it was in the way of a timber that the projecting side or corner could not be sledged off (care always being taken to brace the boulder securely up into position before beginning to sledge it), recourse to explosives became necessary. A hole would be drilled into the boulder (or slab) so as to break off enough, with a minimum amount of powder, to make room for the timber. Great care was taken in such blasting not to use charges heavy enough to shake the pile badly, which might result in disaster. Dynamite, therefore, was never used in this cave unless it was absolutely unavoidable, as

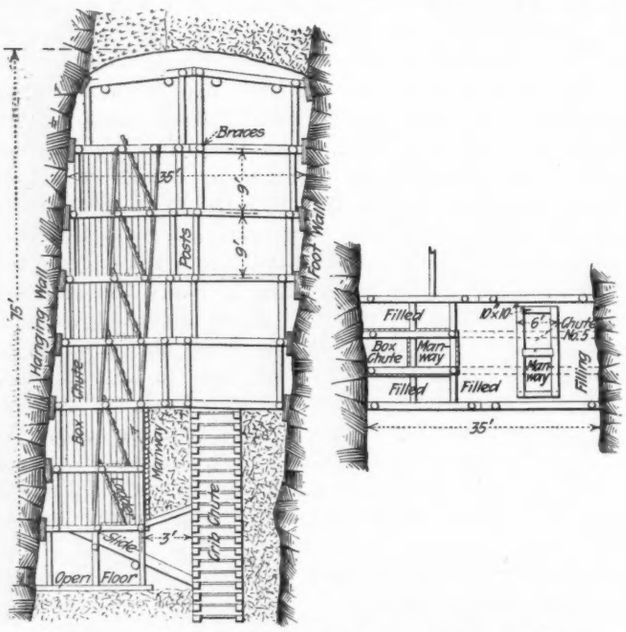

FIG. 3. SECTION AND PLAN OF CENTRAL TRENCH SHOWING METHOD OF CARRYING UP CRIBBED CHUTE AND FILLING

there were large holes or voids in the pile, due to the way the ground had broken. Heavy blasting would undoubtedly have caused serious shifting and possibly have crushed important timbers.

Nothing about the timbering of the central trench is specially to be noted As soon as there was room enough for stulls at 9-ft. centers directly under those above, four pairs of spliced stulls were put in across the trench. These were placed with their centers slightly higher than their wall ends, just as in the case of the catching-up stulls. But though 3-in. planks, three deep, were put in as headboards, the planks themselves were only 2½ ft. long, as their main function was to act as cushioning rather than as friction pieces for tying the stulls to the walls, as in the case of the catching-up stulls. Posts fitting into shallow daps, both at top and bottom, were put in to tie the different spliced stulls together into stull sets, and the stulls and posts were braced sideways from one another on the different floors to take care of the side pressure of the filling, and to prevent "jack-knifing" of the timbering in the central trench. The spliced stulls in the

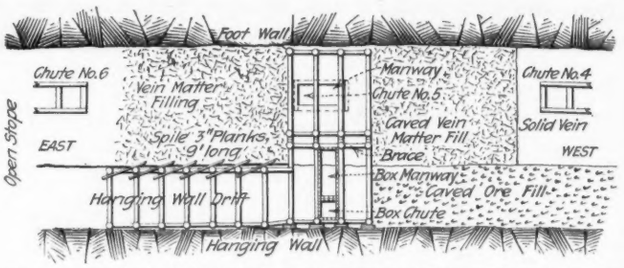

FIG. 4. PLAN OF CAVED STOPE SHOWING SPILED DRIFT AND CENTRAL TRENCH

trench were, of course, blocked into place by tightening the wedges in their headboards after the posts, one at each end of each stull, had been put in, for in that way the stulls of the lower truss, through these posts, were brought securely home against the truss above.

Thus, by first working the ore out along the hanging wall, and then trenching across the pile, the workings being timbered as they were carried down, the ore was worked out a floor at a time, and the central trench carried down until the bottom of the cave was reached. In this way the ore in the east end of the cave was removed and No. 5 chute finally uncovered.

A timbered working 10 ft. wide and 8 floors, or approximately 70 ft., high had now been opened along the hanging wall from No. 6 to No. 5 chute, a distance of about 50 ft., and through tne center of the pile of caved vein matter was a trench 15 ft. wide, 30 ft. from wall to wall, and 70 ft. high, held open by stull sets put in slightly trussed. The cribbed chute that had been uncovered had to be carried up, and the opening along the hanging wall and the central trench had to be filled, before the ore along the hanging wall in the west part of the cave could be mined. For if an attempt were to be made to mine the ore in the west half of the cave without first filling the openings in the east half, so much ground would be open that the timbering along the hanging wall would probably begin to swing, and the chute which had taken so long to uncover would again be lost.

Method of Raising No. 5 Chute

Raising No. 5 chute and filling the central trench was not such an easy undertaking as it might at first seem, for this chute, which measured 12 x 6 ft. overall, and was timbered with 10 x 10-in. cribbing, ran lengthwise with the vein, so that the two central stulls of the trench had to be taken out in order to raise the chute. Moreover, in order to mine the ore in the west end of the cave without first carrying a stope up at that end, it was necessary to carry a box chute and a manway through the filling along the west side of the trench

near the hanging wall, as shown in Fig. 3. This box chute had to connect at the bottom through a slide with the chute compartment of the cribbed chute. Furthermore, this chute compartment was on the east or far end of the cribbed chute, and the manway and timber slide were on the near or west end. To carry such a slide from the box chute to the chute compartment of No. 5 cribbed chute necessitated that practically the entire hanging-wall half of the bottom floor of the central trench be left open.

Obviously it would not do to take the two middle stulls out of this central trench, from top to bottom, in order to raise the chute all at one time. So after the slide had been put in to connect with the cribbed chute, and the stulls on the hanging-wall side on the bottom floor of the trench had been posted up and braced at the posts, the chute was raised, and the central trench filled, a floor at a time. At the same time that No. 5 chute was raised a floor, the whole cribbing was shifted over bodily a little toward the hanging wall, so that, when the top of the cave was reached, the chute was again under the ore, as it was highly desirable that, in mining the ground above the cave, the stope should not be carried any wider than the width of the ore along the hanging, unless drill holes showed that ore was again making toward the foot wall.

Work of Filling Central Trench Begun

As soon as the slide on the bottom floor had been put in from the bottom of the box chute to the chute compartment of No. 5 chute, the work of preparing the central trench for filling began. Posts were placed under the two central stulls, about 3 ft. back from the line of No. 5 chute. Then braces were put in to tie these posts and the stulls to the side stulls and posts. After that had been done, the stulls were sawed off about 2½ ft. back from the line of the chute. By that time the two central stulls on the foot-wall side of the chute had also been taken out.

Then, while No. 5 chute was being raised to the stull caps of the floor above, with a hole 3-ft. square left in the side of the cribbing where the slide from the box chute joined it, a manway-and-chute compartment was started next the hanging wall and on the west side of the trench by putting in, even with the outer edge of the ore, braces from the outside to the central stull, and lagging them. Then, when the other side of this compartment had been lagged off, and the bottom floor had been covered over, everything was ready for dumping in the filling. Lagging the bottom floor of the trench was easy, except for the space left between No. 5 chute and the ends of the sawed-off stulls. This opening was covered over without possibility of future damage to the chute by putting in short lagging, lean-to fashion, against the the chute from the regular lagging carried by the stulls.

Method of Filling Trenches With Waste

To aid in filling both the hanging wall and the central trench, the stope tracks were extended into the cave and carried across to the foot wall over the center of the chute trench. Then waste filling was run into the cave by car from the raise to the east.

In filling the cave the sole precaution taken was to dump only the finest filling around the cribbed chute, and that part of the trench was always filled first, so that no boulders would roll over against the cribbing. For when large boulders or timbers get against the side of a cribbed chute, there is danger that the pressure of the filling will finally drive them through the cribbing. Moreover, it was to prevent the stulls on the hanging-wall side of the trench from getting against the side of the chute later in the life of the stope that they were cut off from 2½ to 3 ft. back from the line of this chute.

As soon as the central trench and the opening at the east end along the hanging wall had been filled even with the top of No. 5 chute, the central stulls on the next floor would be taken out, the chute raised up to the next stulls, fine filling dumped in around the chute, and coarser filling further away, the hanging wall trench then filled, and the process repeated.

When the central and the hanging-wall trenches had been filled up to within two floors of the back, the mining of the ore along the hanging wall in the west part of the cave began. Starting at the top and from the box chute, this ore was trenched out, and the opening held open with drift sets having 10-ft. caps and 8-ft. legs, put in at 5-ft. centers, and with the barren vein filling on the cave side held back with spiling, just as had been done in getting out the ore at the other end of the cave, except that this time the ore was taken out through the box chute and slide to No. 5, instead of to No. 6 chute. When the ore had been worked down to within a floor of the old gob at the bottom of the cave, the slide was torn out and the ore wheeled directly to No. 5 chute.

When all the ore had in this way been sliced out along the hanging wall, the hole in the side of No. 5 chute was closed, the opening at the bottom of the cave as well as the trench along the hanging wall filled, and stoping began in the block of ore to the west of the cave. As that stope rose, the different floors were carried over to the edge of the cave. In that way the sloping back over the west end was squared up for resumption of normal stoping as soon as these floors and the west stope had been filled to within two floors of the back, tramming tracks for the new slice raised to that floor through the stope, and the crossboard lagging put in on the floor above. Thus, without a serious accident of any kind, the ore along the hanging wall was mined out, and the cribbed chute carried up through the center of a pile of caved vein filling 75 ft. high.

Caves Best Reopened by Working Down From Top

In this series of papers I have described methods of contending with practically every condition that will be met in reopening caved stopes in veins having walls strong enough to remain open when the back caves. I have shown how such caved stopes can be worked out with spliced stulls, even when the cave is 30 ft. or so wide, simply by putting in the stulls so as to obtain a trussing effect. I have also shown that when the walls are fairly strong the ore can frequently be removed simply by catching up the back of the cave securely with a truss structure, and drawing the ore out from under this truss without other support. I have endeavored to demonstrate that if care is taken to keep the mass of caved vein matter from getting in motion, it is possible to trench down through the cave and take out

only that part of the vein filling which is rich enough to pay for its recovery.

All the methods detailed were devised by John F. Allen, assistant foreman of the Hecla mine, and are therefore especially adapted to wall conditions as strong as those that generally characterize the Cœur d'Alene veins. But they have a wider application, and no doubt by working out small sections at a time ore can be recovered with equal safety from caved stopes in veins where the walls are considerably weaker, although still strong enough to hold when the back caves.

In another series of articles, to appear later, I shall show in detail how the ore can be removed cheaply and safely, working down from the top, when not only the back, but also the walls of the caved stope have closed in completely. Moreover, in the projected series of articles I hope to prove that the ore in any caved stope is not only more safely but also more easily recovered by working down through the cave than by coming up through it.

Copper Deposits of the Blue Ridge Mountains

By Marshall Haney*

The Blue Ridge copper region of Virginia comprises two districts, namely, that including the deposits from the vicinity of Front Royal southward, embracing Warren, Fauquier, Rappahannock, Madison, Page and Greene counties, and the district in the southwestern part of the state, including the Floyd-Carroll-Grayson plateau. The existence of copper in the Blue Ridge Mountains has been known since the first settlements. There are evidences of a mining boom just prior to the Civil War, at the beginning of which all operations ceased. Most of the properties then remained idle until the last 15 or 20 years, within which period various attempts have been made to reopen them. These operations were generally conducted by wildcat promoters, which tended to discourage legitimate operators.

In the copper region, the mountains are made up of a central core of igneous rocks, mostly of a dense, black, basaltic type, frequently altered to schistose forms and flanked by syenite and similar rocks. At the base to the west, forming the valley region, is the folded sedimentary series of the Cambro-Silurian age. The sedimentary rocks are not copper-bearing. The ore is confined to rocks of the basaltic type.

In the first district the ore consists chiefly of cuprite and native copper, with small amounts of bornite and chalcopyrite. It occurs in crevices and joint planes in small irregular-shaped lenses of quartz and as disseminated grains through the epodotized parts of the basalt. The native copper is often in nuclear masses surrounded by cuprite. Generally the ore does not extend more than 50 ft. below the surface. It is believed that it has been formed by concentration of material leached out of locally copper-rich portions of the igneous rocks. The shear zones have furnished a place for the gathering of the solutions and favorable conditions for deposition of material.

The three principal mines operated in the last few years are the High Top mine, in Greene County; the Blue Ridge mine, in Madison County; and the Gooney-Manor mine, in Warren County. The High Top mine is the best developed and equipped in this district. It is about eight miles east of Elkton on the summit of the southeast spur of High Top Mountain, at an elevation of 3000 ft. Over 2000 ft. of development work has been done. The ore consists of native copper, cuprite and some malachite.

The Blue Ridge mine is situated at the head of the Robinson River, near the crest of the range, in Madison County, 12 miles east of Stanley. The deposit was extensively worked before the Civil War. The ore consists of native copper, blue and green carbonates and some cuprite. All the workings are close to the contact of basalt and syenite, the ore being confined to the basalt.

The Gooney-Manor mine is near the town of Front Royal. The ore occurs in a vein in porphyry and as a contact deposit between limestone and porphyry. The main body has a width of 7 ft. and can be traced for a distance of 800 ft. The ore averages 3% copper, 1 to 6 oz. of silver, and $1 to $8 gold per ton. This property has been carefully developed and is in flourishing condition.

The region in southwestern Virginia is confined to a belt of crystalline rocks passing through Floyd, Carroll and Grayson counties, and is generally referred to as the Floyd-Carroll-Grayson plateau. As to general geology, the "Gossan Lead" is confined to the crystalline schists, its strike conforming to the inclosing rocks. The vein can be traced for 20 miles, with many old workings to aid one. Some of these can be followed for miles at a distance of 20 to 60 ft. below the surface. The wall rock is sericite schist. The vein matter consists of pyrrhotite with stringers of chalcopyrite, generally a series of layers of pure pyrrhotite being mixed with more or less micaceous material. The vein varies in width from 20 ft. to more than 100 ft., and at one point has a proved depth of 735 ft. and a width of 35 ft. The best-developed mines are the Betty Baker, Cranberry, Copper Hill, Vaughan, and Chestnut.

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Patent Examiners Wanted

Men or women who have a scientific education, particularly in higher mathematics, chemistry, physics, and French or German, and who are not subject to the draft for military service, are wanted for the examining corps of the Patent Office. Engineering or teaching experience in addition to the above is valued. The entrance salary is $1500.

Examinations for the position of assistant examiner are held frequently at many points in the United States. An examination is announced for Aug. 21 and 22, 1918. Details as to subjects, places of holding the same, and other relative information, may be had upon application to the Civil Service Commission, Washington, D. C., or to the U. S. Patent Office. Should the necessity arise, temporary appointment of qualified persons may be made, pending their taking the Civil Service examination. Application for such appointment should be made to the Commissioner of Patents.

Dust Prevention in Transvaal Mines*

An important review of the methods used for allaying dust caused by mining operations, and the improvement of underground ventilation. Careful experiments were made, and as a result valuable conclusions drawn concerning the degree of atomization of water most efficient for the removal of extremely fine dust from the air in working places. To prevent the waste of compressed air and the excessive use of water, a type of atomizing apparatus that cannot be tampered with by miners is advocated. The filling of the whole of the mine with atomized water as soon as possible after blasting is advised. Watering down of working faces and walls should be done by atomized water, and only heaps of rock should have streams of water directed upon them. Where water blasts or atomizers are used, there should be a simple and immediate indication as to whether the water blast has been put into operation by the miner or operative responsible.

THE allaying of dust and gases, and the improvement of ventilation, both as regards quantity and temperature of air, should be treated as one subject. A little thought will show that this statement is one of fact. As was pointed out by Dr. Orenstein and E. J. Laschinger in the discussion on a previous paper on mine ventilation, an intense ventilating current can cause a considerable amount of dust to be picked up by the air and carried through the workings; the ill effects of high temperature were also referred to on the same occasion. It necessarily follows that if intense ventilation can cause dust again to circulate after it has been settled, all the subjects mentioned should be considered at the same time.

The use of water has proved to be the best means of allaying dust and some of the deleterious gases and for cooling the air. The use of water in mine workings reduces natural ventilation, and the more efficient the water system for allaying dust and gases and cooling the air the greater the retarding effect on the natural ventilating current. If these statements are accepted as axioms, it naturally follows that some auxiliary means must be adopted to increase the rate of motion of the ventilating current. This may consist of a mechanical device, such as a fan, or the appliances used for allaying dust and gases may be designed to assist the ventilating current to an extent equal to, or in excess of, the retardation caused by the cooling effect of the water used. The obvious means, other than fans, for accelerating the ventilating current, is to have the water discharged in the direction in which the air is flowing, and if the water is atomized by compressed air, the accelerating effect produced by the jet of air and water is considerable.

The discharge of the atomized water in the same direction as the flow of the ventilating current has one ill effect, however, it being the inferior direction for the purpose of allaying dust, which is best attained by the atoms of water meeting the particles of dust. The principle of having the atomized water stream flowing in the same direction as the air current can be carried too far, and at the points where the greatest amount of dust is formed all such streams should be opposed to the ventilation; as there would be only a portion, possibly from one-fifth to one-third, of the jets acting in this direction, the net result, either entirely or to a considerable extent, would be to counteract the retarding effect due to cooling.

Water Best Atomized by Compressed Air

The water used for allaying dust and gases, and for cooling the air, can best be atomized by the use of compressed air. Water can be atomized in two ways: (1) By utilizing high pressure and causing the water to be split into small particles by striking solid surfaces, or by causing it to issue in thin sheets or small jets as it is impelled into the air; and (2) by using compressed air to split it up. The latter is preferable, as the size of the atoms and the direction of flow can be much more easily controlled. The size of water atom or drop is an important factor in the allaying of dust and gases. Large drops are of little comparative value, as they fall out of the air too rapidly. On the other hand, the water can be too finely divided, creating a "dry fog," which floats in the air for indefinite periods. The mean between the two is the most desirable, and there is little doubt that the correct condition is obtained when, with the ventilating current and water atoms flowing at equal velocity, the water atoms can be seen gradually falling; in any case only a small portion of the water should reach the foot wall within 30 feet of the atomizer.

Without the use of compressed air the issuing water is imperfectly atomized, and the stream of atomized water cannot be directed in the exact direction required. A heavy shower of mixed sizes of drops of water, varying from, perhaps, $\frac{1}{8}$ in. diameter down to dry fog, can be created, and a jet can be led somewhat in the desired direction, but only a small part of the water used is efficiently atomized; the remainder falls to the foot wall within a short distance from the atomizer, and, as it flows away to the pump sump, carries quantities of sludge and grit with it, which collect in the sump and cause trouble with the pumps.

The same defect occurs with numbers of water blasts using compressed air, far too much water being used and no attempt being made to prevent the formation of large-sized drops. The excess use of water is frequently made apparent in winzes, numerous cases in which these have been filled with water from the water blasts being on record. The same excess quantity is used in all other development ends, but, as the water can flow away to the sumps, it is not so apparent.

Size of Water Particle

The fact that the size of water atom has a considerable influence on the effectiveness of the dust allaying has been proved by tests carried out by the Phthisis Prevention Committee, in September last, in the Apex

*An excerpt from a paper by Arthur C. Whittome and J. H. Veasey, read before the South African Institute of Engineers and published in the "South African Mining Journal," Nov. 10, Dec. 15, Dec. 22, and Dec. 29, 1917.

Section of the New Kleinfontein. Two sets of tests were conducted: First, experiments with different proportions of water to air, determined by using different sized apertures on the water connection, in order to ascertain the quantity of water put into suspense in the air, at a distance of 30 ft. from the water blast or atomizer, by the different sized apertures, the water used varying with the size of aperture; second, experiments to ascertain the dust-laying powers of the atomized water with the different proportions of water to air.

In each case the "Apex" water blast was the atomizer used. The atomizer is so designed that by means of replaceable diaphragms the quantity of air and water used is regulated independently of the whim of the person operating the appliance. In this series of tests a standard ¼-in. diameter air nozzle was employed, the air pressure being about 70 lb.; therefore the rate of air consumption was approximately 80 cu.ft. of free air per minute. Three different sized water apertures, ⅜, $\frac{1}{32}$, and $\frac{1}{64}$ in. diameter, were employed.

Dust-Laying Tests in Main Airway

The dust-laying tests were conducted in a main airway, in which the air was traveling at about 260 ft. per minute. The air was tested for dust (1) just before it reached the water blast, and (2) 100 ft. beyond the blast; thus a period of about 23 sec. was given for allaying the dust. Two Waugh drills, drilling upholes dry, under a special permit from the government mining engineer, were used to create the dust and were set up 65 ft. to windward of the dust-sampling tube. The visible particles of dust had all settled before the first sampling tube was reached, there being no dust observable by the naked eye at that point during the whole of the tests, though quantities of impalpable dust settled during the test on the outside of the sampling sump and surrounding objects. The tests were conducted by A. J. R. Atkin, of the Miners' Phthisis Prevention Committee. The following extracts from Mr Atkin's report show the result of the tests:

The spray was turned on and allowed to run for two minutes before the drills began working, so that no dry dust was allowed to get into the test length of the tunnel.

The tubes were held horizontally 4 ft. from the floor. Under these conditions falling particles should not have exerted any possible disturbing influence.

The water used for these tubes was that used throughout the mine for sprays and atomizers. Its dust contents were: Dust under 5 mikrons[1] in mg. per liter, 2; dust between 5 and 50 mikrons in mg. per liter, 2; dust under 50 mikrons in mg. per liter, 4; weight of particles under 5 mikrons, 50 per cent.

TABLE I. DUST TESTS WITH ¼-IN. NOZZLE

	Sample No.	Dust Under 5 Mikrons in Diameter	Dust Between 5 and 50 Mikrons in Diameter	Total Dust Under 50 Mikrons	Per Cent. Particles Under 5 Mikrons
Before	2,847	7.0	18.0	25.0	28
After	2,848	0.9	1.2	2.1	43
Before	2,849	12.0	26.0	38.0	31
After	2,850	Trace	0.6	0.6	Nil.
The average of these results is:					
Before		9.50	22.00	31.50	30.15
After		0.45	0.90	1.35	33.5
Percentage allayed		95.26	95.90	95.71	....

The first experiment was made with the ⅛-in. nozzle. This produced fairly large drops, perhaps 200 mikrons in diameter, and at the test distance of 30 ft. from the nozzle suspended 2.96 gm. of water per cu.m. of air; the two tests made agreeing as shown: (1) 3.02; (2) 2.90; average 2.96 gm. of suspended water per cu.m. of air.

The effect of the quantity of water consisting of particles of the size produced by the ⅛-in. nozzle is shown by the results given in Table I.

[1]A mikron is 0.001 mm.

From this it will be seen that with this nozzle 95.26% of the fine dust was allayed, and that the effect was practically proportional to the sizes of the particles, for there was an increase of only 3.15% on the quantity of dust (very fine) after the dust cloud had passed the spray. It is to be noted that this spray is very wetting at a distance of 100 feet.

The second experiment was made with a $\frac{1}{32}$-in. nozzle, which produced particles of water decidedly smaller than the ⅛-in. nozzle, and also some particles so small as to be classed as fog. There was no fog apparent with the larger nozzle. Although there was a considerable quantity of water apparent in the air, the spray was not nearly so wetting as with the ⅛-in. nozzle.

The third experiment was made with a $\frac{1}{64}$-in. nozzle, which produced a very thick fog. At the test distance of 30 ft. it was not possible to see an acetylene lamp flame, and at 98 ft. from the jet the fog was very thick after the jet had been running for 30 min. The mist thoroughly saturated the atmosphere and had not evaported 40 min. after the jet was stopped. It did not appear to be very wetting, although there was a large quantity of moisture suspended in the air.

The amount of moisture suspended by this $\frac{1}{64}$-in. nozzle at a distance of 30 ft. from the jet is: (1) 4.82; (2) 4.70; average 4.76 gm. of suspended water per cu.m. of air.

The amount of water suspended by this $\frac{1}{32}$-in. nozzle is shown by the following result of this test: (1) 4.50; (2) 4.26; average 4.38 gm. of suspended water per cu.m. of air. The effect, in dust, by the water cloud produced by this nozzle is shown in Table II.

TABLE II. DUST TESTS WITH $\frac{1}{32}$-IN. NOZZLE

	Sample No.	Dust Under 5 Mikrons in Diameter	Dust Between 5 and 50 Mikrons in Diameter	Total Dust Under 50 Mikrons	Per Cent. Particles Under 5 Mikrons
Before	2,851	15.0	34.5	49.5	30
After	2,852	2.4	1.2	3.6	66
Before	2,853	9.0	55.0	64.0	14
After	2,854	3.0	5.0	8.0	37
The average of these results is shown:					
Before		12.0	44.75	56.75	21.1
After		2.7	3.1	5.8	46.5
Percentage of dust allayed		77.5	93.07	89.77	....

It will be seen that although 77.5% of the fine dust is allayed, the increase in percentage of fine dust in the total unallayed dust is 25.4%, showing that a spray giving drops of this size has a tendency to leave a larger percentage of the fine dust suspended in the air, although allaying the dust efficiently.

TABLE III. DUST TESTS WITH $\frac{1}{64}$-IN. NOZZLE

	Sample No.	Dust Under 5 Mikrons in Diameter	Dust Between 5 and 50 Mikrons in Diameter	Total Dust Under 50 Mikrons	Per Cent. Particles Under 5 Mikrons
Before	2,855	24.0	86.0	110.0	21
After	2,856	8.0	17.5	25.5	31
Before	2,857	19.0	56.0	75.0	25
After	2,858	11.5	14.0	25.5	45
The average of these results is shown:					
Before		21.5	71.0	92.5	23.2
After		9.75	15.75	25.5	38.2
Percentage of dust allayed		54.0	77.8	72.4	....

The effect on the dust produced by this fog of finely divided water is shown in Table III. It is here clearly shown that although this fine spray suspends a greater amount of water in the air than the others, it is not efficient in allaying the fine dust; 54.0% of the fine dust is allayed, and the usual tendency for the percentage of fine dust unallayed to increase is shown again by the rise of from 23.2% before the spray to 38.2% after the spray. From these results it will be seen that the nozzle with the ⅛-in. orifice is the most efficient dust allayer for fine dust.

The $\frac{1}{64}$-in. nozzle produces an extremely thick fog, but it is evident that the particles are too small to settle readily, so they do not allay the fine dust well. With it established that the ⅛-in. nozzle will allay 95.26% of the dust under 5 mikrons in 23 sec., the apparatus shows itself to be of considerable value.

The authors do not claim that these tests are absolutely final, as the series was not extensive enough to establish the exact, or perfect, sized atom of water which should be attained. It may be that had further tests been conducted at 200 ft. from the atomizer the remaining 4.29% of the total dust (or 4.74% of fine) would have disappeared, or, alternatively, if slightly larger jets for both air and water had been used the

dust might have all disappeared in the 100 ft. But it was clearly established by the tests that all but 4.29% of the total dust (or 4.74% of the fine) was settled in 23 sec.; therefore such a stream of atomized water playing into a dead end would settle the whole of the dust, no matter how dense it was, in a few minutes. A distinctive feature of the system of finely atomizing water by means of compressed air is that the whole drive is filled with fine particles of water. With the finest atomizing a dense fog is created, which is sufficient to mask the light from a group of acetylene lamps at a distance of 20 or 30 ft. This fog is too finely divided to give the best results, as is seen from the test results. On the other hand, this dense fog is probably the best means for preparing the dust for final allaying, and the authors think that the combination of two atomizers—one creating a dense fog at a point 50 to 100 ft. in advance of the other—would provide the ideal system for allaying dust in a development end. As the whole drive is filled with atomized water, every portion of the hanging and side walls is wetted, even the back or projecting pieces of rock, thus providing the most suitable means of preventing any dry dust accumulating at any part of the working place. The ordinary water blast wets the projecting face opposite to the blast, but not the backs of projecting pieces, and it is the side away from the blast which needs wetting, as the air current, carrying dust, strikes that side. The great proportion of the water used with the ordinary water blast is worse than useless; the large drop not only rapidly falls to the ground, but it carries numbers of useless small atoms of water with it, and thus removes a proportion of the water which would have been used to advantage.

Control of Dust-Allaying Appliances Should Be in Official's Hands

The control of all operations of dust and gas allaying, as well as the regulation of ventilation, should rest with one official. Miners should be unable to regulate the quantities of air and water used in water blasts. The authors are satisfied that until these conditions are complied with there will be little further improvement in the dust conditions in mines. If it is conceded that the size of water atoms is of primary importance, then it must be agreed that the ability to regulate the sizes must be taken out of the hands of the miner; he should have an appliance with which he can turn the air and water supplies on or off, but the quantity of these fluids used should be entirely out of his control. It is beyond question that, with the appliances now in general use, there is far too much air used in some working places, and far too little in others, for effective work. The usual air cock in use is 1 in. diameter. This cock can be opened to any degree that the miner chooses. If he opens it full he will use about 1200 cu.ft. of free air per minute for the one water blast, or as much air as is required for from 10 to 12 drills.

Obviously, if all the cocks are opened to their full extent, the air pressure must fall, and the working places nearest to the air mains will have the highest pressure. On the other hand, if water blasts are used with adjustable air orifices, the adjustment being made by one official, and the air supply being either full on or full off, the quantity of air used in the different working places can be controlled to suit the requirements. If similar adjustments for the water supply are combined in the appliance, the necessary quantity and size of water atom are attained without the possibility of interference on the part of the miner. It is obvious that if only a $\frac{1}{4}$-in. diameter outlet is used, in place of a 1-in. diameter one, about $\frac{1}{16}$ the quantity of air is discharged, and either the air in the air-mains is maintained at a higher pressure, or a greater number of water blasts can be used.

It is equally certain that too much water is used in the majority of water blasts, and the quantity used is detrimental rather than useful. The tests previously referred to show that a $\frac{1}{8}$-in. aperture will pass sufficient water to allay large quantities of dust rapidly. The ordinary water blast usually has a water connection varying from $\frac{1}{2}$ to $\frac{3}{4}$ in. diameter, though sometimes 1 in. diameter is employed. Therefore, the maximum quantity of water used varies between 16 and 36 up to 64 times that used with the $\frac{1}{8}$-in. diameter aperture, and less efficient work is done. It naturally follows that if the smaller quantity is required the use of a better quality of water becomes permissible, and it would be feasible to even use Rand Water Board water for water blasts.

Dust and Deleterious Gases Should Be Speedily Removed From the Air

Dust and deleterious gases should be removed from the air as soon as possible after they are generated. This needs no demonstration. If it were possible to carry it to finality, then only those parts of the mine in which dust and gases are created would need to be wetted down. At the present time no effort is made to remove dust and gases from the air at the point where the greatest amount is generated—in the stopes during blasting. The authors are firmly convinced that the final stage in the general laying of dust throughout mines will be reached only when as much care is devoted to stopes as to development ends. It is generally contended that, as the ventilation of stopes is always good, the dust and gases formed therein are carried out of the mine by the ventilating current. This is to some extent true, but almost certainly only partly so.

If ventilation is all that is required, then there are many dead ends which need no water blasts, because their ventilation (by mechanical means) is so good that the whole of the air contents of the drive is rapidly changed; yet, in these days, no one would recommend the discontinuance of the use of water blasts therein. In any case the use of water blasts in stopes should be tested, and the authors are convinced that once they were used they would never be discarded. If such a policy were adopted, there would be water blasts installed at every working place where blasting was in progress. Under such conditions a different policy with regard to water atomizing would develop. At every working face a dense dry fog would be created during blasting, and, at selected points, zones of larger sized atoms would be formed, so that the fog, which would have brought the dust—and those gases which water will allay—into a suitable condition for rapid deposition, would be brought down within a short distance. Such zones should be created, say, 100 ft. from development faces and at the air outlets from all stopes. With

this system the minimum quantities of air and water would be used with the maximum effect.

Atomized water is the best means for removing dust and all deleterious gases except CO from air; therefore, the whole of the mine workings should be filled with atomized water as soon as is possible after blasting. It will be conceded that the mine air should be purified as rapidly as possible after blasting. There are only two means of doing this: by an intense ventilating system, and by withdrawing all deleterious matter from the air. Intense ventilation alone is not to be recommended, as the walls are rapidly dried and dust is deposited on them, ready to be returned to the air on the slightest disturbance. It is difficult to provide intense ventilation at all working places, and the ventilating current is usually only increased in the best ventilated part of mines, without great improvement at the development faces, by the installation of fans. Or, perhaps, it is better to say that if the total amount of air circulated through a mine, on the adoption of mechanical ventilation, is doubled, there is only a slight increase in the quantity reaching the development faces. If, however, a complete system of fine atomizing of water is adopted, and the working places and traveling ways are filled with dense fog, the fog being allayed in certain zones, the whole of the dust and gases, except CO, will be brought down in the minimum time without the necessity of intense ventilating currents.

This system, of course, is not a new one. It is the method which has been so frequently recommended, and so seldom adopted in mining—never on the Rand—of filling the mine with atomized water by the use of steam. Steam could not be used in deep-level mines, owing to the difficulty of producing it at the desired points and to the greater trouble which would arise through heating up working places which already are too hot. Assuming that 1 lb. of water if highly atomized will densely fog 560 cu.ft. of air, it follows that 1000 gal. will as densely fog the air in 17.5 miles of 6 by 10 ft. drives, or 57 gal. to the mile. From this can be calculated the amount of water which would need to be highly atomized to fill the working places and traveling ways of any mine. Different mines would need different proportions of the heavier-atom zones for settling fog, some proportion of which would be deposited on the walls of the mine by contact. But it can be easily seen that the amount of water required in any mine is a negligible quantity. The great advantage of atomizing water by the use of compressed air, instead of by first generating and then condensing steam, is that it cools the mine instead of heating it. Nitrous fumes and CO_2 are rapidly absorbed by water, but CO is not to any appreciable extent soluble, therefore the ventilating current must be almost entirely relied upon to remove this gas.

Continuous Means for Removing Dust Necessary

The "deadly" dust is invisible; therefore, continuous means of removing it from the air, and of ascertaining the daily condition of the air itself, should be provided at selected points in the main airways. There are two aids by which the invisible dust can be continuously removed from air: by mechanical separation at definite points, and by the stream of air being intermittently super-saturated with water in the form of fog, the water being deposited at intervals either by contact with already wetted walls or by a shower of larger water atoms. The latter system gives the advantage that the air is slightly cooled at each point where it receives the fog, or rather between that point and where evaporation of fog ceases. A considerable cooling effect could be obtained if at stated intervals in the main airways small water blasts or so-called atomizers were installed and continuously operated, fogging the air to an extent which would not incommode the workmen, but to such an extent as would prevent evaporation from the mine walls or running water, and would, in fact, keep the walls wet, after they had been wetted (subsequent to blasting) by filling the mine with fog. The quantity of water and air required for such atomizers would be small, the apertures in the air cones being not larger than $\frac{1}{8}$ in. and the water-cone apertures, say, $\frac{1}{64}$ in. As these water blasts would be continuously in operation, they would need no cocks, and they would be erected at all points found desirable, including ore passes, ore bins, stope boxes, stope air outlets, and the like. At some of these points the air and water cones could be increased in size so as to provide for the amounts of dust created, say, at ore passes, ore bins, grizzlies, etc. The sizes of the air and water cones can be regulated by the official in charge of the installation, but cannot be interfered with by the workmen. These water blasts discharging in the direction of flow of the ventilating current would continuously assist in accelerating the air velocity.

There is no question that a continuous sampling of the air, at selected main air outlets from working places, would tend to a great improvement in the working conditions of all mines. The present great difficulty consists in the operations of collecting and testing air samples occupying such a long period; even then the results only show the conditions for a few minutes out of the 24 hours. It is hoped that a system for giving a continuous record over the whole 24 hours will be thoroughly tested.

Watering Down of Working Faces and Walls

Watering down of faces and walls should be done with atomized water; only heaps of rock should have streams of water directed upon them. One need only to see a street water cart at work to realize the importance of this point. The small jets of water raise clouds of dust. A large jet of high-pressure water, such as is used for watering down faces in mines, must have an even greater effect than the small jets of a water cart. Therefore, clouds of invisible dust must be thrown off the walls by the jet of water; portions of this dust are caught by the stream, but considerable quantities must be held by the air and flow with the ventilating current. The use of streams of atomized water would obviate this, as the stream which dislodged the dust could be made wide and only small quantities at one side of the stream would escape being caught. In any case, hanging and side walls should be wetted down against and not with the flow of the ventilating current, so that dislodged dust would flow into the stream of water and not away from it.

The mechanical ventilation of dead ends should be on a system by which induced currents could be directed to the working faces, while foul air would be exhausted

from the working places. There are two systems for the mechanical ventilation of dead ends: (1) fresh air is delivered as near as possible to the working face through pipes, the acceleration of the current being attained either by air jets or fans: (2) fumes and foul air are drawn from the working place by similar means, and delivered to the main return airway. There are advantages for each system. By (2) the foul air is delivered to the upcast shaft without passing through other working places; therefore a minimum amount of dust is deposited after blasting. By (1) the current of fresh air is delivered with velocity at the end of the ventilating pipe and sweeps forward to the working face, driving out foul air and keeping that portion of the working place sweeter than is possible with the exhaust system, by which the air current is drawn along the drive toward the face but is short-circuited immediately it reaches the end of the exhaust pipe, only a small portion of the air reaching the face. At many of such working places there is little fresh air other than that from the rock drills actually delivered to the working face. The authors suggest that the preferable system would be a combination of the exhaust system with a modified pressure arrangement. A short length of air pipe, with an air jet therein to accelerate the air current, should be installed with its outlet as close to the face as is feasible, the inlet being on the windward side of the exhaust pipe end. This would provide the necessary velocity to deliver air to the face, and if the accelerating jet was of the water-atomizing type the air delivered would be fairly free from dust.

Simple Indicator of the Operation of Water Blast Required

There should be a simple and immediate indication as to whether the water blast has been put into operation by the miner responsible. This check should be available as soon as the miner is out of the mine. One of the complaints most frequently made in connection with developers is that they do not turn on the water blast. The omission to perform this duty has a doubly bad effect, in that the dust is not laid at its point of origin and the working place is not wetted down. The omission of dust laying, of course, involves the possibility of gas remaining in the working place; most of the gassing accidents in dead ends are due to this cause. It is obvious that it is desirable that there should be an absolute check on the surface, showing whether the miner has or has not turned on the water blasts.

It should be a part of each shift boss' duties to test each water blast in his section, ascertaining that it is in good order and pointed in the correct direction. The miner must, under the regulations, test his water blast before lighting up. So that the only cause of trouble which is possible, apart from an actual failure of the air or water supply after testing, would arise owing to the water blast, or its connections or pipes, being damaged or buried or the apparatus being knocked over and the jet of atomized water delivered in the wrong direction. The design of the apparatus and its method of installation should be such that no damage can occur to it and no change of direction of the stream be possible. At the same time the miner should be compelled to turn on the air or water, or else convict himself of the omission.

Sulphur Mining in Mexico*

By Trinidad Paredes†

On the Huascamán estate, San Luis Potosi, there are a number of mines belonging to an American corporation, and sulphur is extracted at the rate of 800 tons per month and sold at an average price of 50 pesos per ton. The greater part is exported to Europe. In the Sierra de Banderas, Durango, there are other mines, which produce a large amount of sulphur which is sold to a neighboring dynamite factory. In the same locality there are still other mines, at present abandoned, but capable of production if developed. An advantage in this case is that they are near to railroads.

Sulphur has been mined in the district of Viesca, Durango, but the mines have not been developed to any extent. To the south of Venado, San Luis Potosi, there is a small property which has produced four tons a day. To the south of Guadalcázar, in the same state, there is a mine which produced 25 tons a month in 1913. About 80 kilometers from Matamoros, Tamaulipas, there is an important deposit. To the south of Calexico, Lower California, there are considerable quantities of sulphur which can be readily shipped to San Francisco and sold there for $12 per ton. Other deposits in Lower California are at Promontoria and Las Vírgenes.

The value of sulphur exported from Mexico during 1903-1913 reached P. 153,841, and the value of imports P. 919,402.

Mexican Paper Currency

The Carranza government claims that seventy millions of paper currency of the Bank of London and Mexico has now been called in and restroyed, leaving only thirty millions outstanding, according to the *Economist*. This balance is to be redeemed as soon as the process of liquidation permits. The work of retiring and incinerating the paper issues of other banks is progressing rapidly, and many millions have been disposed of in this manner. Little now remains of the different national paper issues, all but a limited amount having been called in and destroyed. All this is said to be in connection with the radical and far-reaching changes in Mexico's monetary system, which, among other reforms, seeks to raise the gold unit value so that it will be substantially above the bullion value of the silver peso. But in the light of the present lack of confidence in the fiduciary money in Mexico, arising out of the paper-money experience of the last three or four years, it is not deemed to be safe to inaugurate the new coinage system with a smaller reserve than 35%, though 40% will more likely be the figure decided on. It is hoped by the government that within a few years "after confidence has been restored and business and banking have resumed their normal proportions," a reserve of 30% will be adequate for the country, and that this would be in the form of gold, only a small part being in silver. It is further proposed that a portion of this reserve should be kept in New York or London, to be drawn against or increased by additional deposits in the settlement of the republic's international trade balance.

*Abstracted from the "Boletin Minero."
†Mining engineer.

The Wastage of Coke Byproducts

By Frederick MacCoy*

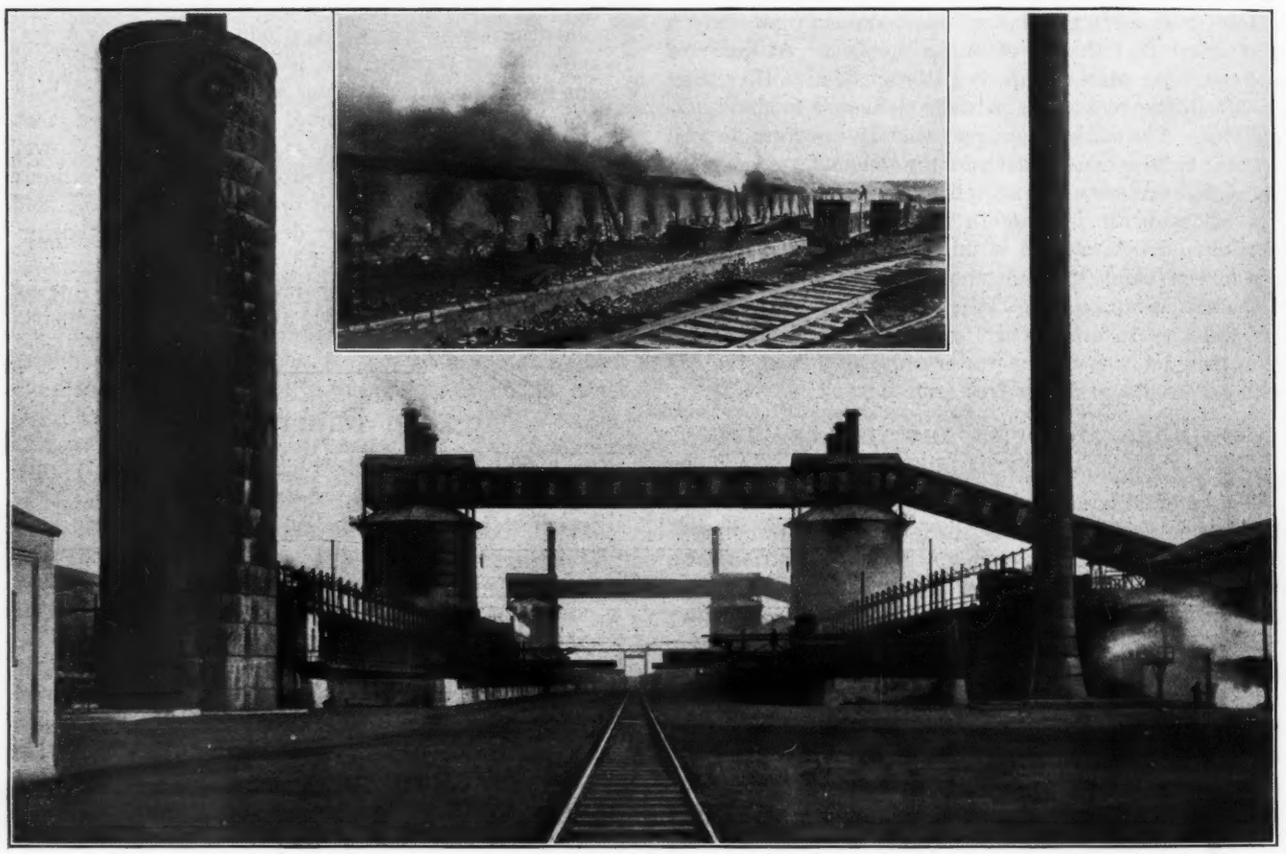
The study of coal wastage has been greatly intensified by the war, but such great stress has been placed on the wastage in mining and manufacturing establishments, that little, in comparison, has been done to prevent another waste of great importance—the loss of valuable byproducts from the bee-hive coke oven. The financial value of this waste in the United States is large. Although the exact figures are hard to get, a reasonable estimate of the value of the byproducts now recovered exceeds $50,000,000 per year, while the wastage exceeds that figure by half. The loss through neglect of coke byproducts has been so forcibly brought out by the war that it is entirely probable that the end of the war will find the United States making use of them as a valuable asset, and no longer dependent upon other nations for many of the necessities of a modern civilization which may be included in the expression "coke byproducts."

Innumerable products from coal gas and coal tar have been put upon the market, but it is pertinent to mention only a few of the most important coke byproducts represented by cyanides, ammonia, toluol, benzol, nitrates, heating and illuminating gas, and tar. At the beginning of hostilities between Germany and the Allies, practically all of the sodium cyanide used in the recovery of gold and silver came from Germany and Belgium. One small plant in New Jersey furnished a limited supply. Today the shortage has been only partly overcome, with the result that some mines have turned to the flotation process.

In 1914 the United States produced 180,000 tons of ammonium sulphate, and imported 90,000 tons; all of which could have been recovered from the smoke of this country's coke ovens. The United States is now spending $20,000,000 in the erection and equipment of a plant for the production of synthetic nitric acid, when the ammonia produced by American coking plants would more than suffice for the basis of a nitric-acid production far in excess of the estimated capacity of the Government plant.

Toluol and benzol, with their innumerable derivatives, motor "gas," carbolic acid, bases for dyes, solvents for paints, explosives, etc., form a valuable group in the series of byproducts. The bee-hive ovens are wasting enough illuminating and heating gas to light and heat many of our large cities, so recently suffering from the fuel shortage. Coal tar is going up in smoke in sufficient quantities to build thousands of miles of national highways, or to furnish the crude material for many medicines and drugs.

The value of these products was undoubtedly better known by Germany than by any other government, if Belgium be excepted. No doubt this knowledge formed one of the greatest incentives to greedy Prussia for the invasion of the territory of her little neighbor, not only to take what was thought to be the shortest road to Paris, but to secure the output of the numerous byproduct coke ovens, so useful in modern warfare.



BEE-HIVE PLANT AT BLOSSBERG, NEW MEXICO (INSET), AND A MODERN BYPRODUCT COKING PLANT AT GARY, INDIANA

*Mining engineer, 613 South 2nd St., Raton, New Mexico.

The history of the byproduct industry dates from 1792, when the process of making coal gas was discovered by Murdoch. However, in this process, gas was the principal product, and a poor quality of coke the byproduct. Numerous attempts were made to develop a process for the production of gas from the standard coke oven and its utilization for the heating of adjoining ovens. Some of them met with more or less success, yet no satisfactory process resulted whereby not only a high-class coke could be produced, but a commercial quantity of the byproducts as well, until after 1880.

Experiments by Otto and Koppers in Germany, and by Schniewind in the United States, added much to what was then known about the business, and in 1906 a commission of engineers of the United States Steel Corporation made an exhaustive study of the European systems, with the result that the commission recommended the erection of a bank of Koppers ovens, which were built at Joliet, Ill., in 1908. Although byproduct ovens on other systems had been built in the United States before that time, the coke produced had not satisfied the metallurgical requirements as well as bee-hive coke. Today byproduct coke is the acknowledged superior.

The principal drawback to the more rapid extention of byproduct coking has been the initial outlay required. A byproduct coking plant is an expensive establishment. Before installing a byproduct coking plant not only is a thorough investigation of the available coals required, but the problem of disposing of all finished products must be considered. To produce just such products as can be disposed of readily is an important item in the proper design of the plant.

The byproduct of the ovens comes off in the form of gas, and, as in the production of commercial gas, a separation is made of coal tar as a preliminary treatment. The resulting gas may then either be washed with water to recover the ammonia, or, as in the Koppers process, with weak sulphuric acid to form ammonium sulphate. After the extraction of the ammonia, the gas is again washed, usually with a petroleum oil that distills at approximately 300° C. This wash oil extracts from the gas the benzol, toluol, xylol and solvent naphtha. A preliminary distillation of the wash oil next produces a light oil composed of the absorbed constituents, together with a slight amount of the wash oil. Further distillation then separates the product into its component parts. The light oil composite produces about 70% crude benzol, which is one of the products that is, in my opinion, destined to play a much more important part in the future than in the past. As a motor "gas" it stands upon a par with gasoline, with which it readily mixes. It is claimed by motorists that a mixture of the two is better than either alone.

Alcohol has not been found a satisfactory motor fuel, yet when mixed with benzol it makes an efficient fuel. It is a curious fact that though alcohol will not mix with gasoline, although it mixes with benzol, a mixture of benzol and alcohol may be mixed with gasoline. The coal tar may be used as such, or separated into carbolic oil, creosote, anthracene, and pitch, with a wide range of possible intermediates, the separation of which depends principally upon distillation temperatures. With these as bases, innumerable chemical compounds may be produced. Separation of the principal products is not difficult, but an elaborate and expensive equipment is required for the complete separation. However, many of the byproduct plants do not go any further than the separation of the more easily won byproducts for which there is a ready market.

Corindite, a New Refractory

According to Alexander Bigot in an article in the *Iron and Coal Trade Review*, M. Noel Lescesne has invented and patented a process which consists in heating in a cupola a mixture of bauxite and anthracite, using a forced draft. Under the influence of the fire and the combustion gas, the bauxite is reduced and aluminum carbide is formed, which in the presence of air is transformed almost entirely into alumina, and the heat developed is such that the mass is fused by successive layers—a special contrivance preventing the material from adhering to the refractory lining of the oven. This operation terminated, the mass is cooled by air, and a vesicular fused block is found, in which a large number of small alumina crystals are disseminated in the solidified mass.

Analyses of this fused mass indicate Al_2O_3 68.8%, TiO_2 3.85%, SiO_2 21.40%, iron oxide 5.25%. The fused bauxite has been designated by the name "corindite," on account of the crystallized mass of corundum. Red fused bauxite resembles emery in its composition and is a powerful abrasive. Corindite is crushed and mixed with finely pulverized refractory binders, such as bauxite and kaolin. Lime and magnesia are avoided in the binder. The mixture is molded into bricks, which are dried and baked. Between 1350 and 1400° C, they undergo no shrinkage; between 1700 and 1730° C, they lengthen 0.5%; above 1750° C. they begin to undergo shrinkage, which reaches a limit of 3% at 1850° C. Porosity varies from 9 to 12%. The resistance to wear is great, the new refractory having 3½ times more resistance to wear than good magnesia brick.

Bolivian Exchange

Since the promulgation of a decree by President Gutierrez Guerra of Bolivia, on Feb. 27 last, the exportation of gold from Bolivia has been entirely prohibited, states the *Economist*. The decree was rendered necessary because the national congress closed its sessions without coming to any decision upon the important project submitted for regularizing the operations of the banks which had *billetes* (banknotes) in circulation. Had this step not been taken by the Executive, in all likelihood there would have been an internal crisis through lack of metallic currency. To protect the stock of gold—*oro sellado*—in the banks, there has been kept in force the law of moratoria for all obligations payable in metallic currency, obligations among which were included banknotes issued by the banks of the republic, institutions which, for that reason, had no necessity for making use of their gold reserves. The importation of gold was rendered impossible by the absolute embargo on exportation in all the countries where Bolivian commerce had available balances. Bolivian exportations had left in favor of the country considerable sums.

The Moore-Edmands Process of Precipitating Gold With Charcoal*

By A. W. ALLEN

Up to the present the use of charcoal as a precipitant of gold from aurocyanide solution has not been successful. A new Australian process, involving the use of finely ground charcoal, is described, which, in practice, has shown improvement in results and greater economy over the standard and more expensive zinc method.

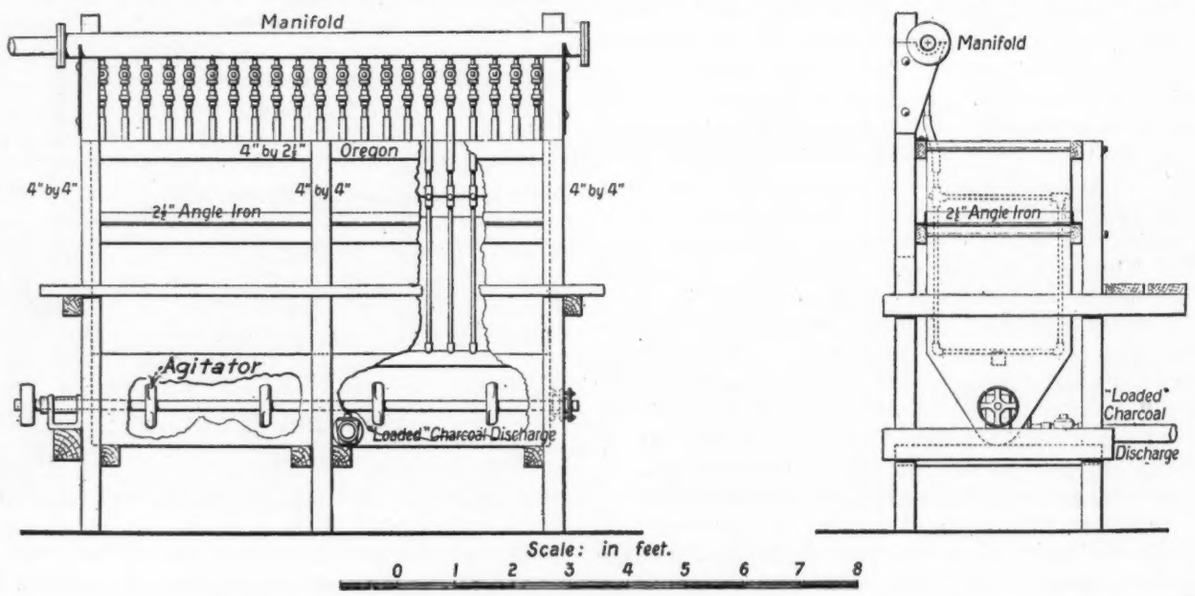
A NOTEWORTHY advance in the metallurgy of gold is due to the efforts and ingenuity of K. Byron Moore and H. R. Edmands, who have resurrected the question of charcoal precipitation of gold from aurocyanide solutions, and, after exhaustive laboratory experiments, have perfected a system of precipitation with charcoal slime which apparently leaves little to be desired. The method has been finally adopted at the Yuanmi mine, Western Australia, and is also being practiced in South Africa. In the former case a foul and complicated cyanide solution containing antimony and arsenic is successfully freed of its gold. With zinc precipitation there was trouble and loss from high tails solution, the cost of zinc was considerable, and, even after extensive refining, the bullion was comparatively low grade. By the adoption of the new charcoal method the effluent from the extractors may be reduced to contain only a trace of gold. The bullion, after simple smelting, is valued at about $20 per oz., as compared with about $17 per oz. for a similar product after zinc precipitation. The saving in the cost of recovery of the gold is about 25c. per ton of ore treated.

After a year of operation, a statement of result was published by H. G. Walton.[1] No fouling agent similar to the double zinc cyanide appears in the solution; and such a result would automatically effect a saving in cyanide consequent on a permissible reduction of cyanide strength in the solution. No figures are available in this connection, but in a later publication by H. R. Edmands[2] it is to be noted from comparative results of the use of zinc dust and charcoal that the necessary cyanide strength in the case of zinc was five times as much as when charcoal was used.

The principal features of the new Moore-Edmands process are as follows:

The charcoal used is water quenched when red hot, washed, and wet ground in a small ball mill to as fine a product as possible.

A special form of extractor is used, consisting of a miniature vacuum filter of what is known outside Australia as the Butters type. The suspended frames are 2 ft. 3 in. x 2 ft. 9 in., and there are 21 to each extractor. The filter media are, respectively, coconut matting as a support, filter canvas, and an outer protective layer of calico. The extractor is shown herewith and contains four propeller agitators in the bottom of the hopper, attached to a horizontal shaft.



THE MOORE-EDMANDS EXTRACTOR

Solution and charcoal pulp are pumped to an extractor, and the vacuum is started as soon as the leaves are properly submerged. Fresh solution is added concurrently with the formation and maintenance of cake, and the supply of liquor is such that a continuous stream passes through the charcoal. The propellers are kept in operation, and percolation is continued for 24 hours or other predetermined time. The vacuum is then released, the charcoal cakes are dropped to

*Excerpt from an article in "Chem. & Met. Eng.," June 15 1918.

[1]Report of the Department of Mines of West Australia, 1916.
[2]Bull. Inst. Min. & Met., London, March, 1918.

the hopper bottom of the extractor, emulsified, and re-formed on the filter leaves by the application of vacuum. This cycle of operations is continued at intervals as long as the charcoal possesses sufficient activity to precipitate the gold. The extractors are worked in series, the one whose cakes are approaching gold saturation receiving the richest solution, the tailings from this going to the second extractor, and being finally impoverished by contact with fresh charcoal.

Washing of Charcoal-Gold Precipitate

The final emulsified charcoal pulp, loaded with gold, is delivered to a clean-up press, washed, and dried with compressed air.

Calcining

Burning of the charcoal is carried out in braziers, 18 in. x 18 in. x 18 in., and made of ½-in. aperture stout wire screening. The operation is carried out in a locked steel chamber and takes about 48 hours.

Smelting

The flux adopted is as follows:

	Parts
Precipitate	100
Borax	40 to 50
Sand	50
Salt	10

Plain graphite crucibles are used and they have a long life.

Fineness of Bullion

A comparison of results with charcoal and zinc precipitation is as follows:

	Charcoal	Zinc
Gold	954.4 fine	825.2 fine
Silver	7.0	21.9
Base	38.6	152.9

Weight of Charcoal Required

Walton[3] states that one ton of charcoal will precipitate 770 oz. of gold by this method, and that the weight of calcined ash is about one-third of the original weight of the charcoal. Edmands[4] gives the percentage of gold in the calcined ash as from 10 to 14%. The enormous increase in the precipitating power of charcoal by fine grinding is indicated by the fact that, by the old method of percolation through extractor boxes, five tons of charcoal was needed to precipitate about 700 oz. of gold.

The charcoal used at the Yuanmi mine is an otherwise waste product from producer-gas manufacture. The wood used is locally known as mulga scrub and is a variety of the acacia family, which includes several wattles indigenous to Australia. It is possible that the character of the wood, which in some species contains a considerable amount of tannin, has a favorable effect on the final result. Different woods have widely different precipitating values when made into charcoal and used for the recovery of gold from cyanide solutions.

The sole drawback to the method appears to be the amount of material to be smelted. The actual smelting entails no difficulties, and there is little corrosion of crucible. The latter might even be reduced by an alternative flux. In medium- or large-sized plants such low-grade precipitate is best smelted in large tilting furnaces—an arrangement permitting the periodic pouring of slag only, the gold being allowed to accumulate in the bottom of the crucible, where it refines. This method minimizes the temporary loss by shotting, which occurs when small charges of gold are poured through a large bulk of cooling slag. The furnace also acts as a safe during night operations, when there is less available supervision and when minimum handling of bullion is advisable.

[3]Ibid.
[4]Ibid.

Callow Pneumatic Machine Notes

When siderite occurs in the ore, a considerable amount of trouble is often experienced on account of the rusting of the siderite to the cloth through which the air is blown to make the froth. Indeed, it is because of this difficulty, as well as because of the greater speed and ease with which the cloth of the pneumatic bottom can be changed, that individual pans are now used almost universally in the bottom of Callow flotation cells. At the Bunker Hill & Sullivan plant, where there is much siderite in the ore, it has been found that the life of the cloth on the pneumatic bottoms can be increased to 4 months, or 33%, by using quilted mats the top surfaces of which are impregnated with rubber. These are made by the Goodrich Rubber Co. and cost only 20% more than ordinary canvas mats. There is an additional advantage in that wood pulp does not stick to the rubberized surface as it does to plain canvas.

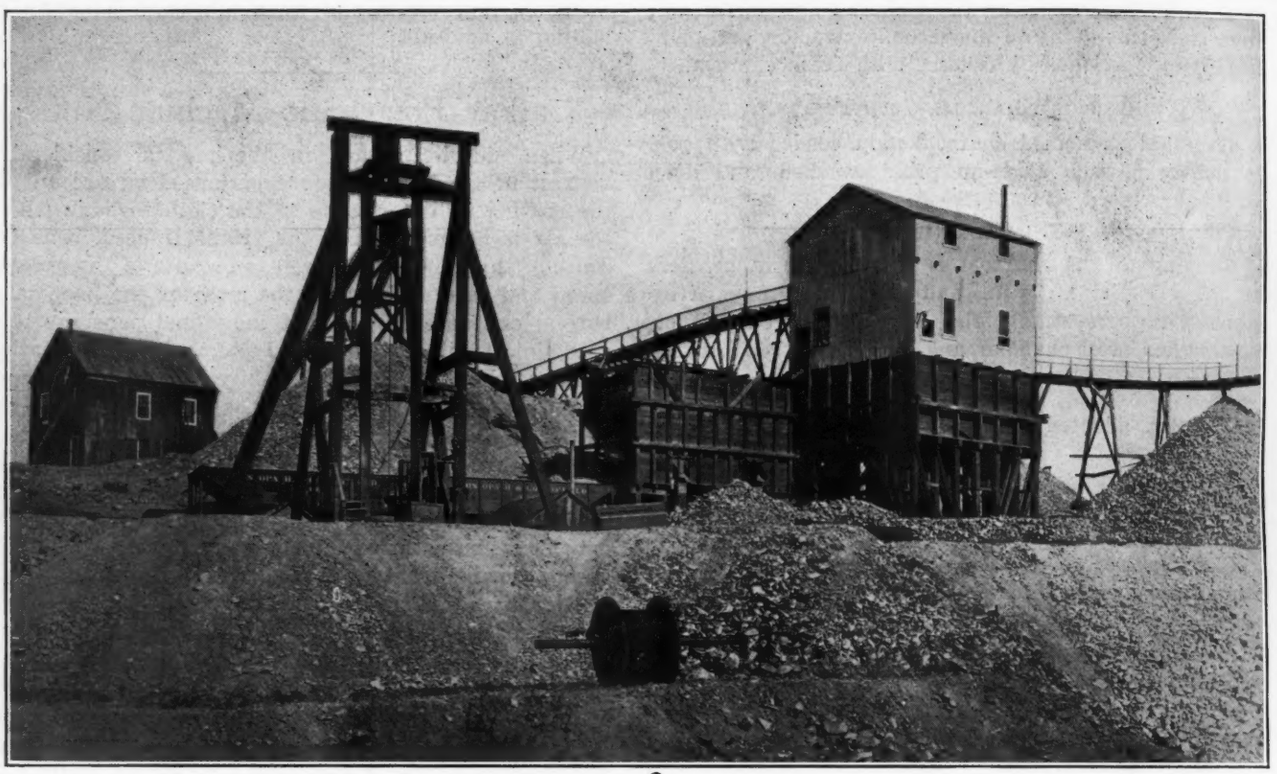
Screens are not used in the Callow pans at most of the plants in the Cœur d'Alene district. After removing them from the machines on the Gold Hunter plant, some trouble was experienced in getting an even flow of air from the pans; but no one could explain why. This was remedied by bolting a ½-in. iron cleat to the under side of the longitudinal center brace running across the cover frame, which in turn is bolted to the pan holding the cloth mat. The air pipe was then tapped, so as to feed the air to the pan at the center of the lower edge of the bottom. Ears are also bolted to the cover plates at the Gold Hunter plant, so as to make it easier to lift the pans out after they have been disconnected from the air pipes that feed them. At most of the mills the cloth is fastened to the pan by means of these cover plates, but at the Bunker Hill & Sullivan plant the cloth is caulked into grooves with rope and no cover plate used, for as soon as it gets wet the rope swells and grips the cloth securely in place.

Priority Administration Simplified

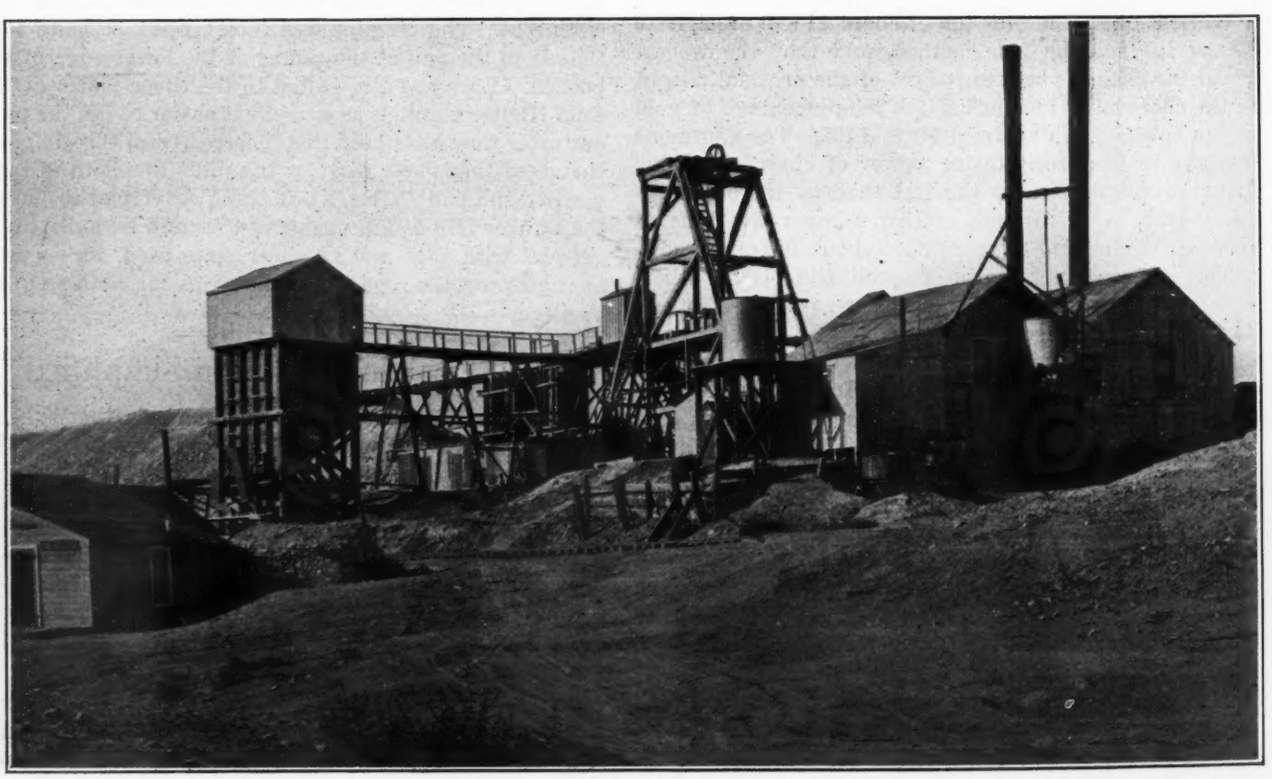
Fundamental changes have been made in the War Industries Board's rules and regulations governing priority in production. Extended automatic classifications have been provided and new classes entitled to preference created. These changes, it is believed, will simplify the administration of priorities, will make it less burdensome to the applicant, and at the same time will give greater assurance that war requirements will be met promptly. A sentence from the announcement telling of the change reads as follows:

"In requesting priority, the petitioner should join with the committee in applying the test: to what extent, if at all, will the granting of this application contribute, directly or indirectly, toward winning the war, and how urgent is the need?"

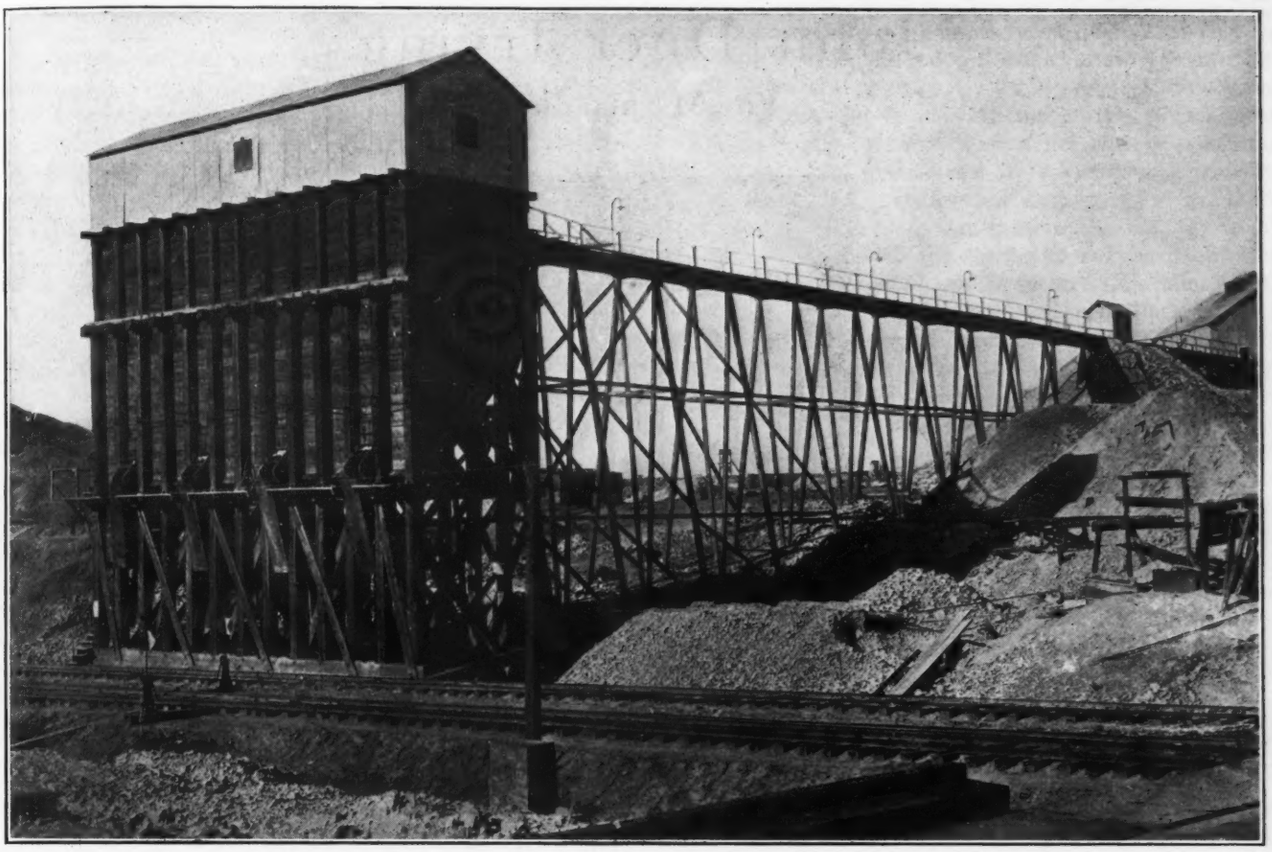
Ore Bins and Surface Plants in Nevada



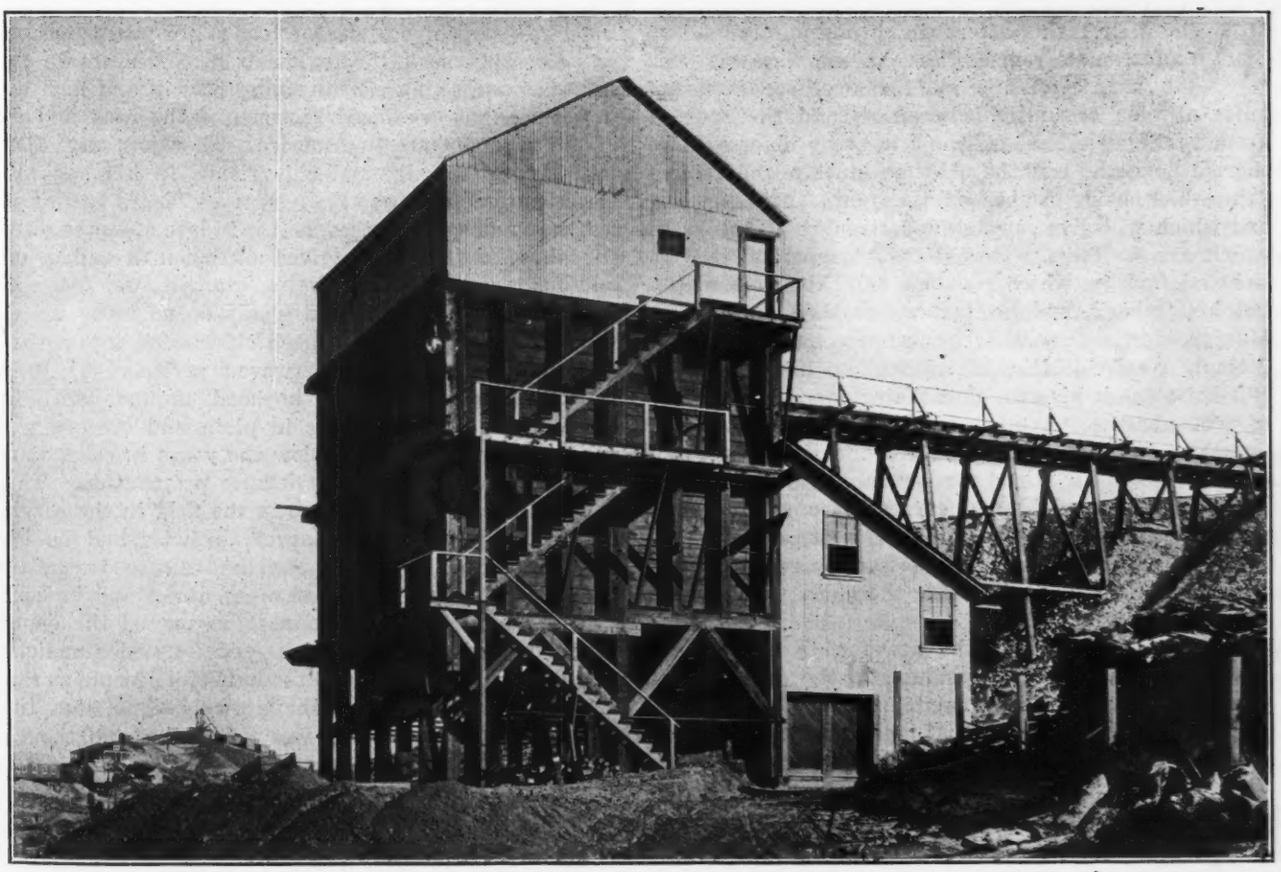
SURFACE PLANT AT JIM BUTLER MINE OF THE JIM BUTLER TONOPAH MINING COMPANY



SURFACE PLANT AT OLD MIDWAY MINE AT TONOPAH IN 1910



ORE BINS AT MOHAWK MINE OF GOLDFIELD CONSOLIDATED MINING CO., GOLDFIELD



ORE BIN AT COMBINATION MINE OF GOLDFIELD CONSOLIDATED MINES CO., GOLDFIELD

John Duer Irving*

In Memoriam

CAPTAIN JOHN DUER IRVING

BY PROFESSOR JAMES F. KEMP*

WE MEET this afternoon to pay our tribute of affectionate remembrance to one who was dear to us all. While more than three thousand miles of blue ocean lie between us and the spot of ground in Flanders made sacred to us by his grave, we cherish none the less the old-time kinship and friendship which have brightened the years that are past and which will give courage and strength to the years which are to come. Here in the chapel of the old Colonial College, which was not only his alma mater, but his father's, and his father's father's, and of his kinsfolk for yet another generation back, we most fittingly recall his life, his works and his friendship. But not alone is his own alma mater paying her tribute of remembrance. Another and still older Colonial college, Yale, now, like Columbia, grown to be a great university, claims our friend for her own. As his teachers here recall the bright and earnest face which looked up to the desk from the student's seat, so there the students who came under his instruction remember the devoted work of one who made their advancement and growth his highest aim.

Even as Yale gave to the new-born Kings College, now Columbia, its first president, in the day of small beginnings, now we of Columbia in this later day of larger growth are glad that our alma mater could place in Yale one who embodied the best traditions and spirit of his college, and one whose character and work will be a treasured possession held in common.

But there is more to be said. The greater part of the last two years of our dear friend's life was passed as an officer of the 11th Regiment of Engineers in the Army of our country. Surviving officers and men are in France, but organized kinsmen of the rank and file of the regiment are in America. They join with Captain Irving's family and old friends in his two universities to do honor to his memory. Theirs is a tie no less deep and sacred, based as it is in love of our country, for whose service he has given all that man could give; and for which, inspired by his example, we, too, each in his or her sphere, would gladly do no less.

The life of Captain Irving divides itself into several successive and closely interwoven periods. There is the formative time of his boyhood, around which influences were cast shaping in plain and obvious way his later career. There follow the years in college and university, of distinct and definite preparation. Then came the years of experience in the field in the service of the U. S. Geological Survey, likewise and no less of preparation. Next comes the call to teach, the irresistible impulse to be of more direct and personal service to his fellows; and as time passed the opportunity to address, at the same time, a wider audience as editor. Suddenly into these useful, inspiring and congenial pursuits woke the growing conviction that the world in which we lived was not what we had thought it; that our ideals of government, our rules of openness, loyalty and truth in the relations of life, the very conditions of our existence, were in danger and would need the supreme effort to defend them. We slowly realized that the Robber Barons had not passed away centuries ago. The call to preparation for military

*An address delivered at a memorial service in St. Paul's Chapel, Columbia University, Aug. 4, 1918.

service came in the summer of 1916. Plattsburg welcomed Professor Irving, and made him first Private Irving, and then for good service Sergeant Irving. The following spring anticipations proved realities, and Sergeant Irving became Captain Irving of the 11th Engineers, and one of the first to sail for "somewhere in France."

John Duer Irving was born in Madison, Wis., on Aug. 18, 1874. His father, Roland Duer Irving, was at the time professor of geology, mineralogy and metallurgy in the State University of Wisconsin. Roland Irving, the father, had entered Columbia College in 1863, but trouble with his eyes compelled him to suspend his studies in the classical course in his sophomore year, and to replace study with some months of life and travel in England. Ultimately his eyes became stronger, and he entered the School of Mines, completing the course for the degree of Engineer of Mines, in the third class graduated, that of 1869. The class of eleven engineers of mines contained other future geologists. It numbered on its roll Henry Newton and Walter P. Jenney, of the early survey of the Black Hills, where John, future son of Roland, was in the course of years to make his doctor's dissertation, and, with its publication, his really serious entrance into the profession.

Roland Irving was a favorite student of Professor J. S. Newberry, affectionately known to all his students as "Uncle John," and after some experience in mining and smelting joined the Ohio Survey under Dr. Newberry. The work in Ohio was largely performed during the vacations of the University of Wisconsin, to whose chair Roland Irving was called in 1870. Later his residence in Wisconsin led to two events of prime importance in the history of American geology. He began the study of the Gogebic iron range and caught the clue to the origin and stratigraphy of the iron ores in all the Lake Superior ranges; and he later undertook the mapping and description of the copper-bearing rocks of the Lake Superior region. The formative years of the son John were passed in a home where the father, Roland, was preparing the famous monographs on these two subjects. Not alone did John's father work upon their preparation, but the skillful hand and fine sense of color of his mother were placing on paper the beautiful illustrations of the microscopic mineralogy of the copper-bearing rocks, and all in the very early days of microscopic rock study in America. Year after year I have shown these beautiful plates to my classes with a word of appreciation of Mrs. Irving, who so skillfully aided her husband with his monographs.

In John's fourteenth year, illness, preying on a constitution never over-strong, deprived him of his father, and left with him the almost sacred duty of following in the footsteps and continuing the work of one interrupted at thirty-nine in mid-career. Mrs. Irving with her three children moved to the East among her kinsfolk, and John was prepared for Columbia College, to represent the fourth generation of his name upon the alumni rolls. His boyhood period closed and his college and university life began.

He entered in 1892 and took the prescribed courses of the time. The vacation of 1895 following his junior year was passed with one of Professor Osborne's parties, in searching for Tertiary vertebrates in the Brown's Park beds of northeastern Utah. On the observations there obtained was based the first contribution of John Irving to geological literature. Following his senior year, he went with me to the Adirondacks and had a month or two of experience with the old-time crystalline rocks in the mountains around Elizabethtown. The vacation after his first year of graduate study we found a place for him in the field party of Dr. Whitman Cross in the steep and rugged mountains of the San Juan region of southwestern Colorado. About this time I made a visit to the northern Black Hills of South Dakota and became impressed with the extremely interesting problems presented by the local geology, which, as I have stated, had been covered by the pioneer work of Roland Irving's old classmates in the School of Mines, Henry Newton and Walter P. Jenney. A large-scale map had been prepared by Professor Frank C. Smith and Dr. Macgillicuddy, of the Dakota School of Mines, at Rapid City, and by the generous coöperation of these two friends we were enabled to start our John on the field work for his doctor's dissertation. With its completion and the taking of his doctor's degree in 1899, the second period of his life merged into the third period—that of active work in the outside world. The change is always a trying one to a young man and brings an experience in meeting which the steadying hands and advice of his old professors perhaps do their best service.

Combined with a most creditable passing of the civil service examinations, his dissertation on the Black Hills brought to its author an appointment in the ranks of the U. S. Geological Survey, and assignment to the party then undertaking the investigation of the mineral resources of this area. The study of the mines placed our young Dr. Irving in close association with the most respected of American mining geologists, that fine, true, Nature's nobleman, Samuel Franklin Emmons, and in the end made of our John, Dr. Emmons' closest helper. Years afterward when Dr. Emmons passed away, leaving in fragmentary and uncompleted state the great new monograph on Leadville, it was John Irving who finished the manuscript and forwarded it to the Survey ready for the printer.

Following the field experience in the Black Hills, John Irving was busied in association with F. L. Ransome in the Globe district of Arizona; with J. M. Boutwell in the Park City district of Utah; with W. H. Emmons in the Needle Mountains quadrangle of Colorado, and with Howland Bancroft at Lake City in the same state. He also did mapping of coal-bearing quadrangles in Indiana, under M. L. Fuller, and in Pennsylvania, under M. R. Campbell. While on the Survey and spending the winters in Washington, John Irving entered heartily into the life of the younger men and was active in the so-called Association of Aspiring Assistants of the Survey, whose initials were a sort of caricature of the American Association for the Advancement of Science.

But the desire to teach, partly inherited, partly acquired, was very strong, too strong to be longer suppressed, and with its gratification in 1903 John Duer Irving took up after ripe preparation the teacher's part of his career. The opportunity came to me to suggest to my old friend Professor Wilbur L. Knight, of the University of Wyoming, one who might substitute for him during a year's leave of absence. The offer proved

agreeable to Dr. Irving, and he undertook the work, retaining, however, his connection with the Survey for the free time of the vacations. The following year he was called to be assistant professor of geology at Lehigh University, and was promoted to the full chair in 1906. In 1907 he was called to be professor of economic geology at the Sheffield Scientific School of Yale, where he shared in developing the mining course made possible by the gift of the Hammond Laboratory. This professorship Dr. Irving held up to the sad event which has brought us together.

In 1905, while John Irving was at work at Lehigh University, the plan was developed of establishing a magazine which might be the special means of expression and record for the vigorous young school of American students of ore deposits and applied geology, which had then become a marked feature of our scientific life. We gathered a little band willing to risk a part of their worldly possessions in the venture, with no thought of return. John Irving was our choice for managing editor. To his untiring efforts, ably aided by the unselfish work of W. S. Bayley as business manager, we chiefly owe the thirteen volumes of this most valuable and interesting journal. As we turn its pages we see from time to time the subjects which specially appealed to its editor. His work in the mining districts emphasized the importance of oreshoots and local places of value in veins, and he seeks to classify and systematize their causes. He is again impressed with the importance of a comprehensive study of special problems wherever one particular case of them may be illustrated, as contrasted with the generally localized investigations carried on by one individual. The committee which has been for several years studying secondary enrichment with L. C. Graton in charge carries out exactly this idea. John Irving's extended Leadville experience, in the mines where S. F. Emmons first formulated the ideas of replacement of rock with ore, leads him to seek to establish criteria whereby replacement bodies may be identified. Thus as we turn the pages of the magazine we see how year by year an active and thoughtful mind was philosophically pondering now this, now that, important phase of his special branch of science.

And then, while in the full exercise of his many useful activities, rose above the horizon the dark cloud of the Robber Barons' war. In the spring and early summer of 1916, I know from intimate talks, that John Irving felt the danger menacing his country, and others like it, from the growing threat of the worst features of mediævalism. Being unmarried, he believed that, even though he was past forty years of age, it was his duty to go to Plattsburg and enter the officers' training camp. He took up its routine earnestly and seriously and he wrote with great pride of the satisfaction which his promotion to be a non-commissioned officer gave him. When the camp closed he entered his name as one available for service if conditions called for him. In the spring of 1917 those conditions materialized. He took his officer's examination, was appointed captain and was granted leave of absence by the authorities of Yale. At first he expected to serve as topographic engineer or as an interpreter of the airplane photographs. He jestingly referred to himself as "skyographer." Actually he became a recruiting officer for the 11th Regiment of Engineers, in whose ranks are so many of our friends and colleagues. With them, he sailed for France in July, 1917. Of his special field of work we are not fully informed, because of the censorship, but my own letters from him inform us that he was early engaged in railway construction and worked just as long hours as one possibly could in building the arteries of supply and nourishment of the Army. His duties last fall we know brought him under shell-fire, and he learned to keep his nerve amid these trying conditions. Like so many of our boys, he writes jestingly of them, taking the dangers in the light-hearted way of our countrymen as being all in the day's work.

Later, when tunneling and the exploding of mines beneath the enemy's works achieved such importance, he was transferred to the engineers' school at headquarters, and was busy with a seemingly endless procession of classes to be instructed in the rudiments of mining engineering. His letters show that the calls were hard, exacting and exhausting. He speaks of never having worked so hard in all his life. Probably his vitality ran low, and his powers of resistance and recuperation were exhausted. We only know that on the 26th of July, despite every effort, pneumonia could not be resisted, and that one more name was added to the honor roll.

As we all look back over this brief sketch of the many activities of a busy and useful life, we see that it was filled to the very limit. Those of us who knew John Irving well, know that the duties and calls were met faithfully and with a high sense of responsibility. Many of them were essentially unselfish. The magazine *Economic Geology* was a labor of love. The time of Professor Irving was never so valuable but that a student could command advice and guidance. The full strength and more of Captain Irving was given to his country. And yet we know that the calls often bore heavily on a physique none too robust. Although tall and broad-shouldered of stature, our friend had some delicacy of constitution which asserted itself at times of special stress and which gave warning that certain limits must not be passed.

Though I have spoken of his scientific work, I have not mentioned that many talks while we have been off together on the trips which meant much to us both revealed to me ambitions in literary expression and composition which were in keeping with the high tradition of his family, bound up, as they are, with one of the very first of our really great men of letters. Insistent calls prevented John Irving from realizing all that was in his mind; but the ambition certainly gave lucidity and clearness to his scientific writings.

It is, however, as friend that we like best to recall him, and in these respects we know well that while his work lives after him, the fine sweet inspiration of his life will endure still longer. We live in the most trying times with which we have all been confronted for nearly three generations. Faith is called for as seldom before in our experience. We must have the grim and unshaken holding on to calm belief in the triumph of right and in the subordination of cruelty and unbridled selfishness to the control of law and justice. A decent consideration for the rights of others and observance of them must not perish from the earth, nor must the rule of abominable materialism be permitted to exer-

cise its sway over victims unable to protect themselves. For these high causes John Duer Irving gave his all. Useful and inspiring as he was in life, he rises to yet greater heights in his supreme sacrifice, and to us who yet remain he is a sermon whose moving appeal causes to sound aloud the deepest chords of our nature.

We men of engineering training are almost if not quite military in our general attitude toward life. We are repressive of emotion; not that we do not feel, but that we are anxious that our feelings should be real and genuine, and not the light thing that comes and goes like a fickle breeze. Tonight we can give full and deep expression to the very profound emotions which these services evoke. At such times prose fails us. My old classmate and dear friend in the School of Mines, Frank Dempster Sherman, whose verse has an appeal seldom equaled, has left these lines with us as if they had been written of John Duer Irving:

Lord, in whose hand I am but dust,
Make Thou of me a vessel whole,
Worthy to guard the precious soul
Thou gavest me in trust.

Keep me unmarred by strife and sin
Throughout the brief span of my years.
Let joy's bright sun and sorrow's tears
Keep pure the flower within.

Grant, if Thou wilt, mine eye to see
It grow to beauty at thy feet;
To find at last the blossom sweet
Of immortality.

And when this body that is mine,
This earthly frame, which Thou hast made,
Is dust and with the earth dust laid,
Lord, take the flower for thine.

BY WALDEMAR LINDGREN

A WEEK AGO a cable message reported the death of John Duer Irving, Captain in the 11th Regiment of Engineers and professor of economic geology at Yale University. The announcement will bring the deepest sorrow to his many friends and a sense of great loss to geologists all over the world, for Irving was one of the most gifted of those who have devoted their lives to this science. Always intensely patriotic, he was one of the first who joined the Plattsburg Camp in 1916, receiving his commission as captain in 1917. Soon afterward he left for France with one of the first units, and he had since been continuously on duty in the field. During the last months he was instructor in a school of mining as applied to the war in France. Hard work and unremitting attention to his duties told at last on a constitution which was not as strong as his broad shoulders and commanding stature seemed to indicate, and on July 26th he succumbed to an attack of pneumonia.

Captain Irving was born on Aug. 18, 1874, at Madison, Wis., the son of Roland Duer Irving, the noted geologist. It seemed natural and fitting that he should follow in his father's footsteps. His technical education was completed at Columbia University under the guidance of Professor J. F. Kemp, with whom he formed a deep and lasting friendship. In 1899 he received his doctor's degree there, and soon afterward joined the U. S. Geological Survey and spent several years under the direction of S. F. Emmons—the second great geologist who was to help in shaping Irving's career. A professional paper on the Black Hills, written in conjunction with S. F. Emmons and T. A. Jaggar, embodies the results of the studies of these years. In 1904 he was appointed professor of geology at Lehigh University, and in 1907 was transferred to Yale, at which university he held the professorship of economic geology until his death. As a teacher he inspired his students with a strong love for geological science, and many are the geologists of a younger generation who have had the help of his guiding spirit in their studies. For in Irving was combined, as in few men, a depth of learning with a most charming and unassuming personality.

In 1905 when a small group of economic geologists decided on the venture of publishing a journal devoted to the practical side of the science, the question arose as to who should be intrusted with the editorship of that publication. After a short deliberation, Irving's name was proposed and unanimously agreed upon. Irving accepted, and for thirteen years his name was indissolubly connected with the journal of *Economic Geology*. Under his leadership the doubtful venture became a success, and the thirteen volumes embodying the research of American and foreign geologists in the practical field form a worthy monument in honor of the devoted editor more impressive than any granite or marble. It was a work which brought no pecuniary benefit; it was undertaken from pure love of the science, and no one can fully appreciate the amount of often seemingly thankless labor which it involved.

In 1911 Professor Irving wrote a paper on the criteria of replacement in ore deposits, based on studies in many fields. This paper, published by the Canadian Mining Institute, by the American Institute of Mining Engineers, and by *Economic Geology*, attracted general attention and remains a classic elucidation of a most difficult subject.

Many years ago Irving was selected by S. F. Emmons as his collaborator in the new Leadville report which was to complete and bring up to date the description of these wonderful deposits. In joint authorship they wrote a bulletin published by the U. S. Geological Survey on the "Downtown District," or the lower part of the Leadville district. After the death of S. F. Emmons, the preparation of the monograph was entrusted to Professor Irving, and occupied many years of his time. Always refusing to be superficial, Irving devoted arduous work to the deciphering of the complex structures, and finally, just before his departure for France in 1917, the manuscript was completed and placed in the hands of the U. S. Geological Survey for publication.

Many other investigations, too numerous to mention, were undertaken by Irving. In conjunction with Mr. Howland Bancroft, he published, also as a Survey bulletin, a description of the Lake City mining district in Colorado, and many papers in *Economic Geology* bear witness to his keen insight into geological problems.

Besides these scientific investigations, Irving carried out at various times many private examinations of

mining properties in the United States, Alaska, and Canada.

His friends may be permitted to think with sorrow and regret of his passing away at the early age of forty-four years, before he could complete his life's work. But those who knew his gentle and noble spirit best, who knew his indomitable courage and his devotion to duty, also know that he gladly and cheerfully offered the supreme sacrifice to the country he loved so well.

Nitrate Deposits in Amargosa Sink Reported On by Geological Survey

Discovery of large deposits of nitrate of soda in Amargosa Valley, Inyo County, Calif., was reported to the Secretary of the Interior in December, 1917, and he at once called upon the Geological Survey to make an examination. The Survey had already been systematically exploring other well-known nitrate deposits along the Amargosa River above Death Valley, among them those called the Upper Canyon, Lower Canyon and Saratoga deposits. The examination of the new deposits lasted from Dec. 26, 1917, to Apr. 4, 1918.

The results of the work may be briefly summarized as follows: In all, 78 trenches were dug, which had a total length of 3700 ft. and an average depth of 2 ft. 11 in.; 959 pits were dug to an average depth of 1 ft. 7 in.; 1085 samples were taken, from which 930 analyses were made. In the so-called Upper Canyon field, at Acme Siding, 98 acres is estimated to contain 1480 short tons of sodium nitrate, but an overburden of about 100,000 tons would have to be removed in order to extract the "caliche" containing this nitrate. In the so-called Lower Canyon field, 70 acres is estimated to contain 510 tons of sodium nitrate, the recovery of which would involve the removal of an overburden of about 50,000 tons. These two tracts are the largest and best of the ground examined, and, taken together, include 168 acres, which, if workable, might yield 1980 short tons of sodium nitrate, the recovery of which would involve the removal of 150,000 tons of overburden. The results of examinations at other places do not justify estimates of tonnage of nitrate.

The Survey's explorations have led to the following conclusions:

1. The nitrate in the Amargosa district occurs in a blanket of so-called "caliche," about 5 in. in average thickness, which lies about 9 in. below the surface of the ground. The nitrate is accompanied by other salts, chiefly sodium chloride.

2. The soil above and the bedrock below the deposits contain insignificant amounts of nitrate.

3. The high dip and the great thickness of the strata covered by the prospecting make it improbable that deeper beds of nitrate occur in this region.

4. The "caliche" in general contains an average of less than 2.5% of sodium nitrate, the areal distribution of which is uneven.

5. The Zabriskie field, in which the newly found deposit was reported to lie, contains no commercially valuable nitrate.

6. The Upper Canyon and Lower Canyon fields, the most promising in the Amargosa district, together contain, according to careful estimate, about 168 acres of niter-bearing deposits, which, if worked regardless of cost, might produce about 1980 short tons of refined nitrate.

7. The quantity of nitrate available in the Amargosa district is so small and the cost of production would be so great that the district as a whole cannot be regarded as a source of commercial nitrate.

8. No further work on the areas already examined is justified, except, perhaps, as purely scientific research.

9. The occurrence of "caliche" nitrate deposits in the Amargosa district, rather than the usual cave or disseminated deposits, makes it seem possible, though improbable, that really valuable deposits of nitrate may occur elsewhere in the same general region.

10. Prospecting should be continued until all similar deposits in other districts have been tested sufficiently to determine their value.

Extensive Bauxite Deposits in British Guiana

As long ago as 1897, and again in 1910, Professor Harrison reported the existence of extensive deposits of bauxite of exceptional purity in British Guiana, stated Sir Walter Egerton in a paper recently read before the Royal Society of Arts. The discovery attracted little attention, however, until five years ago, when the Northern Aluminium Co. of America applied for leases of areas containing such deposits. The British government stipulated that any company working the deposits must be under British control. After long negotiation, a company has been formed by the Americans interested, to meet government requirements, and the first cargo of bauxite has left the colony. This company has acquired large areas of land from private owners and leases of a considerable extent of Crown land in the vicinity of Wismar, at the head of navigation on the Demerara River, near the terminus of the little railway connecting the Demerara and Essequibo rivers. Ships drawing 16 ft. can reach the workings 60 miles above Georgetown. The bauxite deposits have recently been traced almost from the Venezuelan boundary right through the colony to the Dutch border. Further deposits have been located in Dutch and French Guiana, and the Guianas probably contain the most extensive deposits in the world, and some in very accessible positions. Should the industry develop on a large scale, local electric treatment of the raw material with power obtained from one of the great waterfalls is probable.

Producers of Tube-Mill Pebbles and silica linings are given in a recent bulletin of the U. S. Geological Survey as follows: Beach pebbles—Robert Burns & Co., Oceanside, San Diego County, Calif.; Frederick E. Browne, 619 I. W. Hellman Bldg., Los Angeles, Calif.; Encinitas Pebble Co., P. O. Box 499, San Diego, Calif.; John T. Momand, Encinitas, Calif.; Thebo & Tingman, Encinitas, Calif.; Artificially rounded rhyolite—Omer Maris, Manhattan, Nev. Cubical or partly rounded 3- to 5-in. quartzite blocks—Jasper Stone Co., 204 Lytle Bldg., Sioux City, Iowa, Silica linings—S. W. Chiles, 123 Garrison St., Bethlehem, Penn.; E. L. Lull, American Flint Co., Iron City, Tenn., and Jasper Stone Co., 204 Lytle Bldg., Sioux City, Iowa.

Chronology of Mining, July, 1918

July 2—Price of copper advanced to 26c. by the War Industries Board.

July 3—International Nickel Co. began production at its Port Colborne, Ont., works.

July 4—Meeting of chief gold producers of British Empire at London to discuss value received for their product.

July 6—Department of Labor refuses to permit importation of Mexican labor to work in Arizona coal mines.

July 8—International Mining Convention held at Revelstoke, B. C.—Branch of American Mining Congress formed at Oklahoma City, Oklahoma.

July 9—Control of sulphur production taken over by the War Industries Board.—Chemicals Division and Explosives Division created by the War Industries Board.

July 15—Meeting of petroleum producers held in San Francisco, California.

July 16—Control of production and distribution of chlorine gas taken over by the Government.

July 18—A. Mitchell Palmer, Alien Property Custodian, announced taking over of the Becker Steel Co. by the Government.

July 19—Gold mining listed as an essential industry by the War Industries Board.

July 20—Importations of manganese ore from Asia and Australasia prohibited.

July 22—Meeting of stockholders of Mother Lode Copper Mines Co., of Alaska, at Seattle, Wash., ratified sale of all assets of the company to the Mother Lode Coalition Mines Co.—Seizure of certain metal firms, among them being L. Vogelstein & Co. and Beer, Sondheimer & Co., was announced by the Alien Property Custodian.

July 29—First meeting of the American Zinc Institute held at St. Louis, Missouri.

July 31—Telegraph and telephone systems taken over by the Government.

Going Some—the 27th

A squad of A Company recently returned from a tour of duty at the front, after spending six weeks doing construction work. All came back safe and sound. They reported that they found front-line work very interesting and exciting, and they were able to show what mining men can do. They are going to establish a record on the log book of the A. E. F.; every man has made up his mind to that.

The second battalion of the regiment, under Lieut.-Col. M. E. Gilmore, has been transferred from Camp Meade to Camp Leach. He now has over 800 men. A large number of these were recruited in the Joplin district.

The first battalion had to leave without the instruments for the band; but the second battalion has got them, the band is now organized and is playing.

At a recent meeting of the men of the zinc industry in St. Louis, at which the American Zinc Institute was organized, the chairman, Victor Rakowsky, in asking, after the dinner, for subscriptions to defray the expenses of the meeting, proposed that any residue (a common word in the metallurgy of zinc) should be turned over to the fund for the 27th Engineers. This proposal was enthusiastically received, and later Mr. Rakowsky announced that the committee conducting the meeting would be able to turn over at least $1000 to the Comfort Fund for the regiment. The men of the zinc industry always do a good job when they put their hand to it.

A warm friend of the regiment, the manager of a large mine in the Northwest writes that he has started a subscription list among his men and there should be a remittance from them immediately after their next pay day. This is a fine idea. Let mine managers everywhere start the ball rolling among their employees. A little from each man will make a big total for the mine. Let us see what mine will do the most in this way.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$13,664.00
Students of Wisconsin Mining School	50.00
A. M. Plumb	5.00
C. W. Snow	2.50
Charles A. Mitke	5.00
A. A. Hassan	10.00
A. A. Hassan, Jr.	5.00
Emin A. Hassan	5.00
Bernard MacDonald	5.00
C. F. Rand	50.00
Calumet & Arizona Mining Co. and New Cornelia Copper Co.	400.00
Oscar Lachmund (fourth contribution)	10.00
C. N. Bell	10.00
C. S. Witherell	25.00
W. G. McBride	25.00
Karl Eilers	50.00
R. T. Hancock	5.00
E. E. White	100.00
S. Ringlund	10.00
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grether	5.00
Marion J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Associated Miners of the University of Idaho	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burrall	25.00
Livingston Wernecke	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	100.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund	10.00
W. Rowland Cox	10.00
L. D. Huntoon	5.00
Alaska Mining and Engineering Society	50.00
W. R. Benedict	3.00
Etheredge Walker	25.00
Fritz Mella	10.00
Richard McCarthy	10.00
J. N. Houser	10.00
Weedon Mining Co.	50.00
Wm. H. Kinnon	30.00
A. P. O'Brien	10.00
Total	$15,947.11

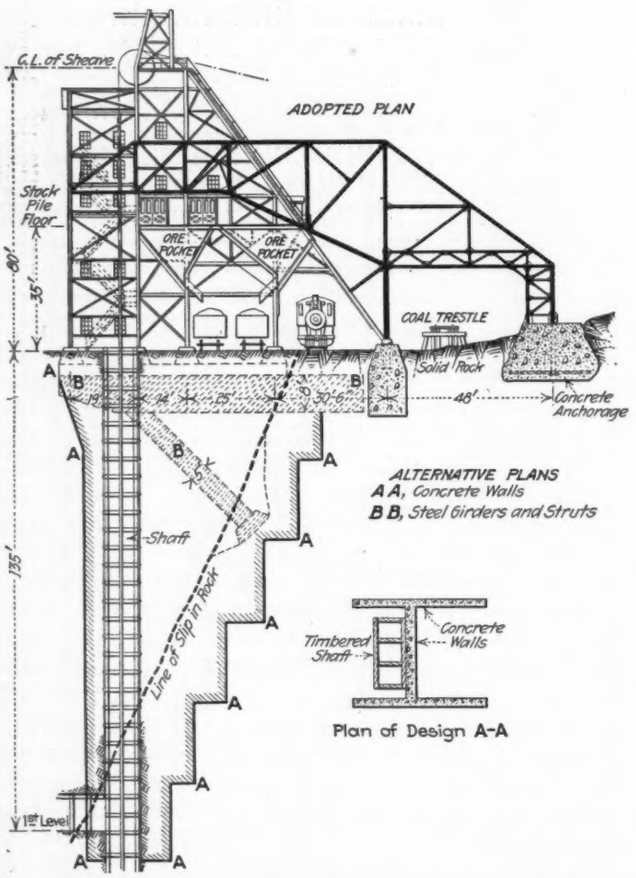
Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Owing to the large volume of work involved in administering the fund, contributions are acknowledged only by publication in the *Journal*.

Details of Practical Mining

Steel Cantilevers Hold Headframe Over Mine Shaft*

Supporting the headframe over a mine shaft by cantilever trusses was the expedient resorted to at the "A" shaft of the Pioneer mine of the Oliver Iron Mining Co. at Ely, Minn., because of unstable ground.

This shaft was sunk in the early '90s, and was then equipped with a timber-frame shafthouse. It had been impossible to explore the ground in advance to such an extent as to determine thoroughly the nature of the underlying rock, but no change of alignment was experienced until 1900, when a slip in the formation was noticed about 135 ft. below the collar of the shaft. The depth at that time was 1110 ft. The alignment was maintained without difficulty, however, by trimming the timbers and occasionally replacing a shaft set.



HEADFRAME OF MINE SHAFT IN LOOSE ROCK IS CARRIED BY CANTILEVER FRAMES

A steel headframe was built in 1909, up to which time the settlement at the surface had not been serious. In this structure the rear columns were placed 70 ft. from the shaft and were supported on independent concrete piers founded in good solid ground. The front columns and ore-pocket columns were supported on a concrete base, 50 x 65 ft. and 3 ft. thick, reinforced at top and bottom with steel rods, so that when settlement occurred the entire front portion would move uniformly, thus causing no undue stress in the steel members.

The bases of the rear columns were provided with a hinged joint. The bases of the front columns and ore-pocket columns were fitted with brackets so that jack-screws could be placed under these to raise the columns and thus take up any settlement of the ground. From 1909 to 1912 the settlement due to the slip in the shaft amounted to 9 in., which was taken up by jacking the front columns of the shaft at different times and putting blocking under the bases. This was all accomplished without any distortion of the shafthouse members.

Movement of the ground became much more serious in 1912, and it was apparently unsafe to continue mining operations near the shaft without making provision to support the shafthouse. Consideration was given to three different methods for supporting the shafthouse and pockets.

The first plan was to excavate the entire portion between the line of slip and the shaft and construct a vertical concrete wall with two wings, all founded on solid rock. This would extend from the first level in the shaft, 135 ft. below the collar, to the under side of the reinforced-concrete base supporting the front portion of the shafthouse, as shown by dotted lines *A—A* in the drawing. The wall would carry the entire load of the foundations, tracks, cars, front portion of shafthouse and ore in shipping pockets, and would support the rear portion of the mine shaft from the first level to the surface. The second plan was to excavate beneath the reinforced-concrete base and place two horizontal steel girders under it, as shown by dotted lines *B—B*. The rear ends of the girders would be anchored on good ground back of the slip, and the ends over the shaft would be supported by structural steel struts or columns placed at an angle of 45° and seated on solid rock.

The third plan, which was adopted, was to construct a steel cantilever support, having its footings on permanent ground back of the slip. This carries the portion of the shafthouse above the stockpile trestle, which consists of skip dumps and headsheaves. All main columns of the shafthouse were disconnected at splices at the stockpile floor elevation, except the rear batter-brace columns, which have a firm footing. The cantilever support thus maintains the headsheaves and skip dumps in permanent position, and the front part of the shafthouse, including the stockpile floor and shipping pockets, now cut loose from the upper portion, will be kept in position by jacking up and blocking the column bases as may be required by ground settlement.

Adoption of this plan was based upon the fact that its first cost was the lowest, and that this structure was above ground, where it could be erected readily and in-

*Engineering News-Record, May 23, 1918.

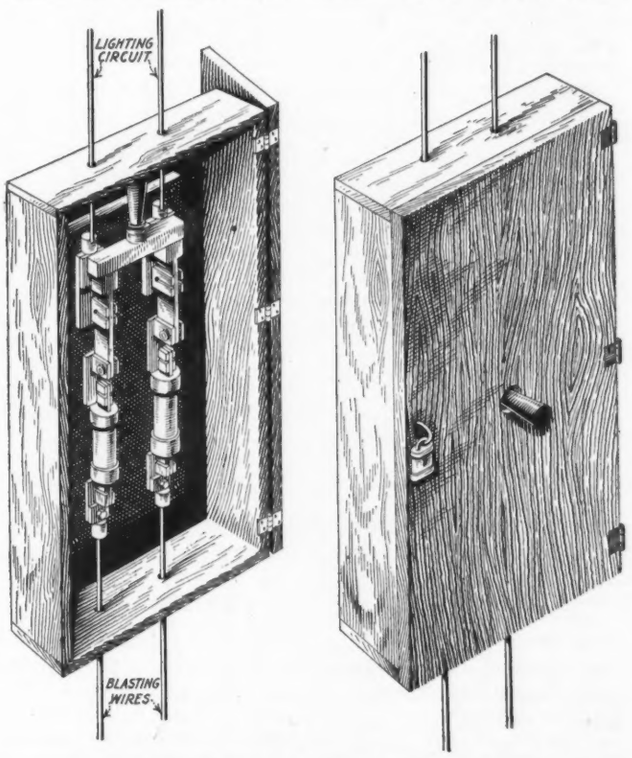
spected easily. As the rear columns of the cantilever support are on solid rock and have an uplift, the pier excavation was made in the shape of a prismoid and the concrete was poured without the use of forms. The concrete pier was made large enough for its weight to balance the uplift due to the weight of the shafthouse portion; the bond of the prismoid in the solid rock is an additional safety factor.

As the mine shaft is constructed of timber sets and is considerably larger than the skips and cages, there is sufficient room for lining the timber guides without retimbering or enlarging the shaft. The cantilever support has now been in service for practically five years, and has kept the upper part of the shafthouse in accurate alignment. The lower portion has settled two feet, which has been taken care of by jacking up and blocking the front column.

Blasting With the Lighting Circuit

BY THOMAS J. PASCOE

The following method of blasting, which is practiced in a mine in the vicinity of Norway, Mich., is sure to explode every hole: The current is taken from a 110-volt lighting circuit, and the charge is fired by means of a single-throw knife switch, connected as



LIGHTING CIRCUIT MAY BE USED FOR BLASTING. BOX SHOULD BE LOCKED WHEN SWITCH IS OUT

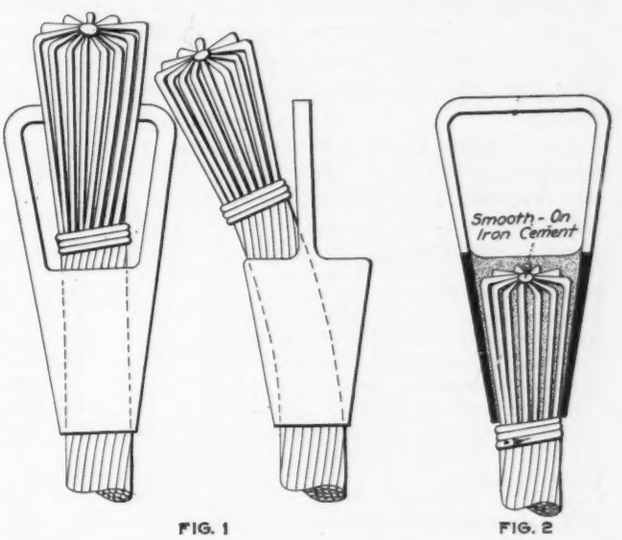
shown in the illustration. The switch is provided with fuse plugs. To explode 15 holes, a 10-ampere fuse is required. The blasting wires are so connected with the switch that, by closing the latter, they are cut into the lighting circuit.

The switch is placed in a wooden box, with a hole cut in the door, as shown. When the door is closed, the handle of the switch projects outside. This is done so that the miner may know positively that the switch is not in contact with the live wires before he attempts to connect his blasting wires to the charge. Otherwise a serious explosion may occur.

The miners prefer the method detailed to the old way with batteries, as it never fails to explode every hole at the proper time. The switch box should always be kept locked, and the key be given to the man responsible for the blasting. The knife switch should be placed with the live connections up. Then in case the door should be left open, and the handle drop, it would not come in contact with the live wires.

New Method of Fastening Wire Cable Ends to Forged Sockets

Many riggers who have experienced difficulty in making a satisfactory joint when placing a forged socket on the end of a wire cable will doubtless be interested in a



METHOD OF FASTENING WIRE CABLE ENDS TO FORGED SOCKETS

new method developed by John T. Willison, of Ambridge, Penn. Mr. Willison, who was testing 19-strand cables for tensile strength, was particularly interested in making a joint which would be stronger than the cable itself. After trying several methods unsuccessfully, the joint failing in each case before the cable was loaded to capacity, he finally conceived the idea of securing the cable in the socket with iron cement in the way shown in the illustration.

The cable end was first passed into the socket, as shown in Fig. 1. One of the outside wires was untwisted and wrapped tightly around the others. Above this wrap the remaining wires were untwisted and belled out as shown, and the ends turned down. "Smooth-On" Iron Cement No. 1 was mixed with water to a smooth putty-like consistency, and the socket packed closely with this material. The cable was then pulled firmly into place and the cement allowed to metallize. In metallizing, the iron cement expanded sufficiently completely to fill the spaces between the wires and between the cable and the socket shell and to wedge the joint securely. A firm union resulted, which, on test, proved to be stronger than the cable itself.

Company Reports

Bunker Hill & Sullivan Mining And Concentrating Co.

The 30th annual report of the Bunker Hill and Sullivan Mining and Concentrating Co., covering the fiscal and calendar year 1917, shows a larger tonnage mined than in any previous year and larger sales of silver and lead. In addition to a record production, considerable development was done and the smeltery began operations.

Ore reserves blocked out total 3,457,419 tons. The operating data are summarized in the accompanying Table I. At the Caledonia and the Sierra Nevada Consolidated properties, operations were continued. At the Alhambra, the experimental work proceeded with fair results.

TABLE I. BUNKER HILL & SULLIVAN OPERATING DATA, 1917

Tons mined	493,030
Mill ran, days	355.70
Tons milled	493,030
Assay of feed, lead %	10.6496
Assay of feed, oz. silver	4.317
Tons concentrates	103,981.84
Average assay concentrates, % lead	45.1967
Average assay concentrates, oz. silver	16.2794
Contents, concentrates, tons lead	46,996.499
Per cent. extraction, lead	89.51
Contents, feed, oz. silver	2,128,436.87
Contents, concentrates, oz. silver	1,692,765.17
Per cent. extraction, silver	79.54
Value of feed	$10,878,283.04
Value of concentrates	$4,943,782.37
Economic extraction, %	45.44
Tons milled per 24 hours	1,386.08
Tons concentrates produced per 24 hours	292.33
Tons lead produced per 24 hours	132.12
Mining cost per ton mined	$2.385
Milling cost per ton milled	$0.600
Concentrate cost per ton shipped	$0.227

The returns from lead and silver shipped were $9,546,874, and miscellaneous income increased the receipts to $10,158,497. Operating costs and charges totaled $6,306,423, which left $3,852,074 as the year's operating profit. Deductions of $1,634,690 for depletion of ore deposits and $$325,804 for income and excess-profits taxes left $1,891,580 as net profit. Dividends paid during the year totaled $2,043,750, and the gross surplus as of Jan. 1, 1918, was $44,-

Unit costs of exploration and mining are shown in Table II, and those of milling in Table III:

TABLE II. UNIT COSTS OF EXPLORATION AND MINING, BUNKER HILL & SULLIVAN, 1917.

	Cost per ft. Exploration	Costs Per Ton Stoping	General	Total
Superintendent and foremen	.....	.....	$0.023	$0.023
Shift bosses	$0.172	$0.039	.....	.040
Machinemen	1.825	.130	.001	.136
Chuck tenders	1.044	.046	.....	.049
Miners	0.242	.181	.....	.181
Shovelers	1.743	.357	.....	.362
Carmen and trammen	0.173	.042	.....	.043
Motormen	.....	.021	.....	.021
Timbermen and carpenters	1.692	.168	.007	.180
Hoistmen and skipmen	0.253	.007	.....	.034
Pumpmen	.....	.....	.....	.011
Pipemen	.....	.....	.003	.003
Nippers	.....	.013	.....	.013
Supplymen	.....	.032	.012	.044
Repairmen	.....	.....	.010	.010
Timekeeper	.....	.....	.004	.004
Contractors	3.422	.....	.....	.011
Concretemen	.....	.....	.001	.001
Miscellaneous labor	.....	.....	.002	.002
Powder	3.172	.085	.001	.095
Fuse and caps	0.491	.017	.....	.019
Illuminants	0.059	.006	.....	.007
Lubricants	.....	.001	.....	.002
Timber and lagging	1.236	.224	.002	.230
Miscellaneous supplies	1.735	.072	.015	.106
Machine shop repairs	0.871	.027	.002	.041
Electrical repairs	.....	.009	.003	.016
Building repairs	0.022	.....	.008	.008
Tool shop repairs	0.421	.013	.....	.014
Electric power	.....	.002	.....	.029
Compressed air	1.256	.085	.....	.090
Heating	.....	.....	.012	.012
Surveying	0.236	.005	.009	.015
Train service	.....	.....	.014	.014
Tramming ore	.....	.....	.....	.051
Tramming men into mine	.....	.....	.....	.003
Tramming supplies into mine	.....	.....	.....	.004
Contingent expense	.....	.....	.053	.053
Legal services	.....	.....	.005	.005
Depreciation	.....	.....	.084	.084
Administrative expense	.....	.....	.089	.089
Free light, water and rent	.....	.....	.001	.001
Taxes and insurance	.....	.....	.172	.172
Total normal expense	$20.065	$1.582	$0.533	$2.328
Extraordinary expense	.....	.....	.057	.057
Total	$20.065	$1.582	$0.590	$2.385

TABLE III. MILLING COSTS, BUNKER HILL & SULLIVAN, 1917

	Costs in Dollars per Ton: Crushing and Conveying	Screening	Jigging	Grinding	Concentrating	General
Superintendent and foremen	....	....	....	....	....	.014
Shift bosses and sampler	....	....	....	....	....	.011
Crushermen	.003	....	....	....	....	....
Conveyormen	.006	....	....	....	....	....
Machinemen	....	.014	.025	.024	.025	....
Oilers	....	....	.009	....	.009	....
Roustabouts	.001	.002	.001	....	....	.002
Laborers	.006	....	....	....	....	.002
Watchmen	....	....	....	....	....	.010
Experimental labor	....	....	....	....	....	.003
Screens	....	.003	.003	.001	....	....
Belts	.014	....	.001	....	.003	.002
Buckets	.011	....	....	....	....	....
Roll shells	.002	....	....	.002	....	....
Ring dies	....	....	....	.001	....	....
Mullers	.001	....	....	.001	....	....
Crusher parts	.003	....	....	....	....	....
General machine parts	....	....	....	.001	.004	....

	Costs in Dollars per Ton					
	Crushing and Conveying	Screening	Jigging	Grinding	Concentrating	General
Pebbles	....	....	....	.006	....	....
Miscellaneous supplies	.009	.005	.013	.007	.014	.009
Liners	....	....	.002	....	....	....
Trommel screens	....	.009	....	....	....	....
Flotation supplies	....	....	....	....	.003	....
Machine shop repairs	.001	....	....	....	.004	....
Electrical repairs	....	....	....	....	....	.002
Building repairs	.001	....	.003	.001	.008	.012
Mill shop repairs	.003	.004	.003	.002	.007	.001
Electric power	.028	.003	.015	.025	.020	....
Water and water power	....	.001	.003	....	.004	....
Electric light	....	....	....	....	....	.005
Heating	....	....	....	....	....	.021
Assaying	....	....	....	....	....	.007
Train service	....	....	....	....	....	.002
Contingent expense	....	....	....	....	....	.011
Depreciation	....	....	....	....	....	.043
Administrative expense	....	....	....	....	....	.018
Taxes and insurance	....	....	....	....	....	.036
Fire protection	....	....	....	....	....	.003
Experimental supplies	....	....	....	....	....	.003
South mill operation	....	....	....	....	....	.026
Totals	.066	.041	.078	.071	.101	.243

Dome Mines Co.

The Dome Mines Co., Ltd., operating a gold mine in the Porcupine district of Ontario, reports for the year ended Mar. 31, 1918, a net deficit of $45,869. This poor showing was a result of the mine's having been closed during four months of the year. Labor conditions, in the mine especially, owing to a large proportion of enemy aliens being employed in that department, grew steadily worse, and finally necessitated the shutdown. The results of operations during the first eight months are shown in the accompanying tabulation.

OPERATIONS AND EARNINGS OF DOME MINES CO. FIRST EIGHT MONTHS OF 1918.

	Total	Per Ton
Tons ore milled	247,000	$4.272
Earnings		
Amalgamation bullion	$ 735,655.16	2.978
Cyanidation bullion	295,103.14	1.195
Total recovery	$1,030,758.30	$4.173
Operation and maintenance:		
Mining, including hoisting	234,534.94	.949
Development redemption	117,299.38	.475
Crushing and conveying	26,912.39	.109
Milling	234,473.29	.949
Executive expense, N. Y. & Toronto	7,591.32	.031
Administrative and general expenses at mine	47,331.84	.192
Taxes and insurance	18,036.94	.073
Total operating cost	686,180.10	2.778
Net operating earnings	$344,578.20	$1.395
Other revenue	10,445.58	.042
Net profit	$355,023.78	$1.437

The net profit indicated for the period of operations was wiped out and a deficit for the year created by a net loss of $118,564 during the four months' inactivity and charges of $282,329 for plant depreciation. One dividend of 25c. per share and aggregating $100,000 was paid. Ore reserves are estimated at 1,950,000 tons, averaging $5.10 per ton.

New York & Honduras Rosario Mining Co.

Favorable results, although not as satisfactory as those of its banner year, 1916, are shown by the report of the New York & Honduras Rosario Mining Co. for the calendar and fiscal year 1917. The company operates a silver mine with important subsidiary gold values at San Juancito, Honduras. The year's income totaled $1,676,846; operating and other charges, including $62,896 for New York administration expenses, were $1,075,966, leaving $600,879. Reserves for depreciation, insurance and taxes totaled $94,005, leaving net earnings of $506,874. Dividends aggregating $300,000 were paid during the year, and $220,325 was set aside for mine depletion. The average price obtained for silver was 84.1c. per ounce.

Ore mined during the year was 141,218 wet tons, and 125,900 dry tons was milled. The average content was 15.03 oz. silver and 0.117 oz. gold per ton. Recovered silver was 1,670,612 oz. and gold 13,790 oz., representing extractions of 88.3% and 89.7%, respectively. The accompanying tabulation shows comparative operating costs in pesos for 1916 and 1917:

NEW YORK & HONDURAS ROSARIO OPERATING COSTS IN PESOS PER TON, 1916-17.

	1917	1916
Tonnage milled	125,900	128,030
	Cost per Ton	
Mining	8.33	8.23
Milling	5.67	5.53
Administration	2.29	2.39
Totals	16.29	16.15
Increase	0.14	....
Value of peso in U. S. currency	46c.	39c.
Average rate of exchange	219	259
Cost per ton in U. S. currency	$7.43	$6.30

It is evident that the rate of exchange plays an important part in the costs, because though on the peso basis the cost per ton as compared with 1916 was only 14 centavos higher, reduced to a gold basis it was increased by $1.13 per ton.

Silver King Consolidated Mining Co.

Satisfactory operation in all departments was secured during 1917 by the Silver King Consolidated Mining Co., according to its annual report. The company operates a silver-lead mine in the Park City district, Utah. Progress made in the development of a new ore zone was particularly gratifying.

The fiscal period has been changed to correspond with the calendar year, and for that reason the report covers only 11 months' operation. Ore shipped totaled 10,260 tons, 9014 tons being crude ore, the rest concentrates, of an average value of $67.79 per ton. Ore sales netted $642,447 and dividends aggregated $383,287. Production of metals was as follows: Silver, 451,627 oz.; lead, 5,016,627 lb.; gold, 403 oz.; and copper, 248,771 pounds.

The Gold Output of the United Kingdom for the year 1916 amounted to 207 oz., recovered from the treatment of 1338 tons of ore from a mine in Merionethshire.

Events and Economics of the War

Early in the week American forces took Sergy and Seringes on the Marne front, and the battle resolved itself into gun duels and rear-guard actions the last days of the month. Allied troops advanced on a 10-mile front from Buzancy to Fère-en-Tardenois. The Germans have retreated behind to the Vesle. American troops took Fismes by assault, and obtained a footing on the south bank of the Vesle in this sector.

The Soviet at Archangel has ousted Allied envoys. Field Marshal von Eichkorn, German dictator in the Ukraine, was assassinated by an alleged agent of Czecho-Slovaks. Bonar Law has asked the Commons for a £700,000,000 vote of credit, and Sir Eric Geddes announces a net gain in shipping tonnage over submarine depredations of 100,000 per month.

Senator Reed, of Missouri, urges one-man control of aviation by creation of an air minister. McAdoo has announced a three-weeks' campaign for the 4th Liberty Loan, Sept. 28 to Oct. 19. Provisions extending draft ages from 18 to 45 years recommended to Congress in War Department's new man-power program.

Combing Non-Essential Industries For Labor

The need for an additional million men for work in vital war industries has led to the establishment of Government control of unskilled labor, and the adoption of labor bureaus where the agents in charge will have full power to withdraw men from non-essential industries as occasion demands.

No advertising for unskilled labor in future will be permitted by firms or individuals who employ 100 or more persons engaged in the work of essential productions. All efforts to secure employees must be made through the nearest Government bureau. It is also not permissible to recruit labor through the recognized agencies without a permit.

Will License Exports to Mexico

Applications for licenses for exporting to Mexico the various commodities mentioned in the State Department's press bulletin of July 12 will now be considered by the War Trade Board, it has been announced. The list of articles given in the bulletin referred to includes coke, which will be licensed if drawn from certain specified districts; articles of iron and steel manufacture except where the need of conservation compels restriction of such exports; articles for the exploitation of mines, especially cyanide, dynamite, caps and fuses; and copper in manufactured form, as well as zinc. Licenses for the last two metals will be granted to as great an extent as the conservation measures of the United States will permit. There is a shortage of ferromanganese in this country, and licenses for this commodity cannot be granted with much freedom. Licenses for mining machinery, where required for production of metals, will be granted liberally, it is stated.

Mexico has been receiving cyanide needed for metal production. All countries have been rationed with respect to this commodity, as there is not enough to go around. Export licenses have also been granted for dynamite, caps and fuses, as needed for mining purposes. The other articles on the State Department's list are corn (30,000 tons); ammonia for ice making and refrigerating; agricultural machinery; common soap; and certain foodstuffs, as well as a considerable amount of railway equipment.

Spain a Producer of Potash?

Discovery that Germany does not hold a world monopoly on potash, says a press dispatch from Amsterdam, comes as a blow to innumerable economists who repeatedly have assured the Germans that the Fatherland could impose its own terms of peace because the world, and especially America, was bound to come to Germany for fertilizers.

The government has just presented a report to the Reichstag containing the warning that Spain has unexpectedly entered the market as a large producer of potash, and the German mine owners are urged to organize their forces to meet the new situation. *Germania* says: "Our supposed independence as regards the fixing of our own prices is gone."

War Enhances Tin's Importance

Tin is rapidly coming into its own, if indeed it has not already arrived, owing to various causes brought about by the war. Tin importations into the United States, according to a compilation by the National City Bank, of New York, averaged 12.9c per lb. in value in 1897, 27.23c. in 1900, 30.52c. in 1910, 39.97c. in 1917 and 59.4c. in April, 1918, and responded to a recent jump of $50 a ton in London with quotations in the New York markets of $1 for "spot Banca," though the import prices above quoted relate to the cost or selling price of the tin in the markets from which imported into the United States, and not those in the New York markets.

Despite the advance in price, tin continues to be greatly in demand in this country, chiefly for making tin plate, the production of which in the United States has grown from 42,000,000 lb. in 1892 to 1,000,000,000 in 1903, 2,000,000,000 in 1912 and 2,766,401,227 lb. in 1917. About 90% of the tin imported into this country since 1893 has gone into tin plate. Imports of tin have grown from 35,000,000 lb. in 1890 to 70,000,000 lb. in 1900, 101,000,000 lb. in 1910 and approximately 140,000,000 lb. in 1917, plus 10,000 tons of tin ore, valued at about $7,000,000. This importation of tin as ore is a comparatively new feature in America's tin supply.

Steel Corporation Advances Wages

The United States Steel Corporation declared the regular quarterly dividend of 1¾% on July 31 and an extra one of 3% on the common stock, thus continuing the annual rate of 17%. It also issued a statement showing net earnings of $153,273,641 and increased wages to an extent that will add at least $25,000,000 a year to the payroll. The action as to the wage advance came as a surprise.

Since the beginning of the war common labor in the mills of the Steel Corporation has received seven advances in pay. The $2 a day level which prevailed up to February, 1916, was advanced in that month to $2.20. The successive stages of the advance up to the latest announcement have been as follows: February, 1916, $2.20; May, 1916, $2.50; December, 1916, $2.75; May, 1917, $3; October, 1917, $3.30; April, 1918, $3.80; August, 1918, $4.20. At the new rates of pay that became effective on Aug. 1, common labor will be receiving more than twice as much as at the beginning of 1916. Before the increase just granted, the average daily wage of all the employees of the Steel Corporation, excluding those in the administrative branches, was figured at around $5, against $2.88 in 1914.

Fuel Oil for Great Britain

The best method of obtaining fuel oil in Great Britain from home sources is by the carbonization of cannel coal, according to a report just issued by a committee appointed by the Minister of Munitions to investigate the question. Cannel coal could be carbonized in existing vertical retorts at gas works, although no largely increased quantity of oil can be obtained from this source during the war, owing to the difficulties of labor, coal, and transport.

The report indicates that other sources of supply will be available in the future. These include drilling for oil in Great Britain, further development of the Scottish shale-oil industry, and increased carbonization of raw coal. In the latter connection it is declared that about 1,250,000 tons of fuel oil might be obtained from every 20,000,000 tons of coal carbonized.

Labor Board Sidesteps Minimum Wage

A resolution has been adopted by the War Labor Board marking the end of a long discussion of the question of establishing a fixed amount as the minimum to be paid to any workman in the United States. The period of the war, it declares, is not a normal period of industrial expansion, from which the employer should expect unusual profits or the employees abnormal wages; it is an interregnum, in which industry is pursued only for common cause and common ends.

The board should be careful, continues the resolution, in making conclusions and recommendations during this period, based on approved views of progress in normal times, which, under war conditions, might seriously impair the present economic structure of the country. The declaration of its principles as to a living wage and an established minimum, the board holds, should be construed in the light of these considerations.

Australian Association Would Exempt Base Metals From Taxation

The Mining Association of Western Australia, with headquarters in Perth, has been organized to keep the importance of the mining industry before the public and to impress upon the people and the government the necessity of fostering its development at this time, according to the *Chem. Eng. and Min. Review*, of Australia. At a hearing before the State Treasurer, it was contended that treatment charges in eastern Australia were excessive, and should be reduced, and that, so far as taxation was concerned, the base metals, such as copper, tin, lead, etc., should be placed on the same exemption list as gold. It was suggested that if base metals could not be exempted, the exemption of £1000 allowed to be deducted in respect of the war-time profits tax on new industries should be increased to £10,000, or, alternatively, that the rate of profit which was exempt should be increased from 10 per cent. to not less than 15 per cent.

Brazil Ready To Lease Monazite Sands

The Brazilian government has announced its readiness to execute leases for mining and exporting monazite. This mineral is found on the seashore almost exclusively. The leases offered by Brazil include the seacoast and such other lands along the shore as belong to the federal government of that country. The Consulate General at New York announced that he would receive bids for them until Aug. 6.

Ordinarily, Brazil is unimportant as a producer of monazite, which is a source of the thorium and cerium used in the manufacture of gas mantles. Much of the thorium so used was formerly obtained from Austria and Russia, but the war has forced the Allied governments to turn to other sources.

Mexico Modifies Oil-Land Tax

Recent agreement between the Mexican government and representatives of other countries will result in modifications of the oil decree of Feb. 19 last. Lands which have been legally leased and manifested but not denounced will be declared free land if not denounced within two months of a declaration by the owner or lessor who makes the manifestation. Lands legally leased can be denounced by the last concessionnaire or by an intermediary if manifestation previously has been made. Grants of land may be reduced at any time and a new title issued.

Penalties are provided for non-compliance with the new regulations, which are effective from Aug. 1. The tax on a hectare of land is reduced from the 5 pesos called for in the February decree to 3 pesos. The government will accept, in payment of title, fees and taxes, credits which the companies have advanced for the dredging of the Panuco River. Oil lands are still held to be in the same category as mineral lands, in that the government retains original title to the subsoil.

Priority assistance is to be withheld, by the War Industries Board, from employers who use competitive peacetime methods in the procurement of labor, resulting in the withdrawal of labor from war industries.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

Bureau of Mines Appoints Gold-Mining Committee

Before tendering any advice for the relief of gold mining, the Bureau of Mines will gather accurate information. A committee consisting of Hennen Jennings, Charles Janin, H. D. MacCaskey, J. L. Mackenzie and F. L. Ransom has been appointed to investigate the matter. A questionnaire will go to all those engaged in gold mining in the United States, and one of the principal points it is hoped to establish is the loss of output which will probably result on account of present conditions.

In the meantime, members of Congress and Government officials are being importuned to make provision for a bounty on gold production. Some are urging that the Secretary of the Treasury should recommend that gold-mining operations be relieved of all state and county taxes. The Director of the Mint is in conference almost daily with those interested in maintaining gold production. It is believed that the Committee on Ways and Means is fully alive to the situation, and that a way will be found which will allow excess profits to apply on such gold operations as are regarded to be proper subjects of taxation, at the same time allowing immunity in cases where the accumulated profits of years become suddenly available.

Object to Proposed Modification of War-Minerals Bill

Friends of the War-Minerals bill as originally drafted are objecting to the proposal to limit the measure to the corporation idea. The good being done by the Food Administration, they declare, would be tremendously lessened if its activities were limited to the wheat corporation. They believe that a buying and selling corporation would interfere importantly with private industry. The licensing feature also is regarded as essential. The case of platinum is cited as an example that adequate powers do not exist for the handling of minerals, when so many difficulties are being experienced with a metal which would be among the easiest to control.

Activity in Chrome-Ore Production

Prospecting is being conducted actively in the chrome deposits of Lancaster County, Penn., and Chester County, Md. This district supplied all the chrome used in the United States from 1828 to 1883. J. H. McGuire, of the Bureau of Mines, who has made a personal inspection of the region, is hopeful that it soon again will become a producer of chrome. Search is being made for chrome sands in the beds of streams.

As no records of the old mines are in existence, there is considerable doubt as to which of them were exhausted and which were closed by their inability to compete with foreign ore. This uncertainty in many cases is deterring prospectors from reopening old shafts, many of which are several hundred feet deep. The old Wood shaft, in Lancaster County, was sunk to a depth of more than 700 feet.

Some hope is entertained that North Carolina may increase its chrome production, and there are many evidences of the interest that mining men are taking in the possibility of developing the industry further.

Complaint is reaching the Bureau of Mines from producers of chrome ore in Oregon that western production of chrome is being generally referred to as California production. Oregon producers claim to be responsible for one-third of domestic production of chrome ore and contend that they should have credit for it.

Common Labor Scarce at War Plants

A shortage of 25,000 common laborers exists among 600 war plants, according to returns made by the first 600 plants to reply to a recent questionnaire sent out by the Department of Labor. If this proportion of shortage is maintained at all war plants, the lack of unskilled labor presents a more serious problem than had been anticipated. During August and September it is expected that the demand for unskilled labor in the war industries will almost double.

Contract labor may be brought into this country from Mexico when it is destined for employment in any mining enterprise. This is an extension of the recent order of the Secretary of Labor which permitted the importation of Mexicans for use in agricultural work and in the mining of lignite coal. The present extension also allows the use of Mexican common labor in connection with construction work being done by or for the Government in the erection of buildings in Texas and in portions of Arizona, New Mexico and California.

Unforeseen difficulties made it impossible for the Department of Agriculture to bring into the United States the entire 120,000 tons of nitrate of soda which was purchased in Chile by the War Industries Board. Owing to the difficulty in securing ships, and from the fact that two of the ships assigned to the transportation of the nitrate were wrecked, it was possible to bring in but 75,000 tons. The nitrate which reached this country was sold to farmers at $75.50 f.o.b. ports.

Fine Crushing of High Siliceous Manganese Oxide Ores from Arizona, California, Nevada and Utah, so as to liberate the manganese oxide from the adhering siliceous gangue, has given encouraging results in the concentrating experiment being conducted at the Lake Superior station of the Bureau of Mines. Flotation tests are being made on rhodochrosite ores from Butte and 70% of the sphalerite contained in the ore is being recovered as a flotation product, the rhodochrosite and quartz remaining in the tailings. The object of the experiments is to determine the best kind and the amount of oil to be used.

Field Artillery Central Officers' Training School

A field artillery central officers' training school for civilians between 20 years and 8 months and 40 years of age, and for enlisted men of the army, has been established at Camp Zachary Taylor, about six miles southeast of Louisville, Ky. The course will be about 12 weeks, and it is planned that new classes will start from time to time, as demanded by the needs of the service and the number of approved applicants. This will be hereafter the only training school in the United States for candidates for commissions in the field artillery, which includes both heavy- and light-horse and motorized artillery.

Civilians entering the school must agree to serve in the Army for the period of the war, if they fail to receive commission—those within the draft age by voluntary induction and those above the draft age by voluntary enlistment. Civilians will be kept in a separate organization for quarantine and preliminary training for about a month after induction or enlistment. Thus the course for them will be virtually four months. Enlisted men sent to the school from various organizations throughout the country as described hereafter will immediately enter the school upon arrival.

Both enlisted men and civilians, after entering the school, will be relieved from time to time, as they demonstrate unfitness to be officers, and will be transferred to other organizations. Successful candidates will be either commissioned second lieutenants immediately upon graduation or designated officer-candidates and sent to replacement depots, where their education and training will be continued and where they will be given practical experience in drilling, training recruits and handling men. As the needs of the service demand, the officer-candidates not commissioned immediately upon graduation will be commissioned second lieutenants from replacements depots, according to demonstrated ability and qualifications, and thereafter promotion to higher grades will be by selection.

Record of Applicant Must Be Above Reproach

The field artillery is in urgent need of a large number of officers. The object of this school is to train a body of men fitted to fill the more responsible positions of command, and every effort will be made to select men of exceptional character and proved ability. Though it is desired to give an opportunity to all eligible citizens to apply, no man should make application whose record is not in every respect above reproach and who has not the fundamental characteristics to inspire respect and confidence.

Officers are needed who have had a scientific and technical education, but this is by no means the requisite to selection of candidates. It is essential, however, that every candidate should now have or be fitted, through previous study, to reacquire at the school a thorough understanding and working knowledge of arithmetic and algebra, to include quadratic equations and plane geometry. Civilians must be graduates of a high school or have pursued an equivalent course of instruction. A knowledge of trigonometry to include solution of triangles and logarithms is desirable.

All candidates must be citizens of the United States. No one is eligible who was born in a country with which the United States it at war or in a country allied to such a country, unless he emigrated to the United States before the age of five years. Older men of mature judgment, gained through experience in business and professional life, are especially desired. Such men need not hesitate to enter because on graduation they cannot be commissioned higher than second lieutenants, as promotion will be by selection and should be rapid if they demonstrate ability. Enlisted men of all branches of the Regular Army, National Army and National Guard, except the Coast Artillery Corps, Signal Corps and labor units, are eligible, but they must possess the qualifications given above for civilians and in addition be recommended through the commanders of the divisions, departments, depot brigades, or camps to which they belong.

Form Provided Must Be Used in Applying

All civilians will be required to make application to attend this school by filling out a blank form provided, in which they agree to enlist for the duration of the war, if over draft age, or be voluntarily inducted if within draft age, and to report at this school when ordered. After filling out these forms, both classes of civilians will be examined by a reputable physician at their own expense, or by an Army medical officer, whose report will be entered on the application in a place provided therefor. A second examination will be required before entering the school unless this preliminary examination was made by an Army medical officer. Thereupon the application will be forwarded by the applicant to the nearest officer on duty as professor of military science and tactics, or other designated agency, together with three testimonials from reputable persons as to good character.

As soon as possible thereafter the applicant will be notified to appear at his own expense for examination before the professor of military science and tactics or other authorized agency. He will be rated and his application will be forwarded, together with a recommendation, to the school. Applications thus received at the school will be reviewed and approved or rejected, and applicants will be notified of the action taken.

Approved applicants above the draft age will be required to report at the school for enlistment immediately upon receipt of subsequent notification to do so, but will receive reasonable prior notice. Approved applicants within the draft age will be required at a subsequent date to appear before their local board within 24 hours after receipt of summons from said board and agree to accept or refuse individual induction. If they accept, they will be inducted into the service and sent to the school within seven days.

Enlisted men are required to make application to attend the school through their division, department, depot brigade, or camp commanders, and will be ordered to the school from time to time when called for by the headquarters at the school.

All civilians while at the school will receive the pay of private, first class ($33 per month). Upon graduation as officer-candidate they will be appointed to the grade of sergeant and receive $38 per month. While at the school and after being graduated as officer-candidates, food, clothing, bedding, etc., will be fur-

nished. A man with a wife must allot not less than $15 a month to her. To this the Government adds $15, if there are no children; $25, if there be one child; $32, if two, and $5 a month for each additional child.

Men within the draft age will be sent to the school at the Government's expense. Those above the draft age will be required to travel to the school at their own expense, but will be reimbursed to the extent of 3½c. per mile. When commissioned second lieutenants, they will receive $141.67 per month, and allotments will automatically cease. Quarters will be furnished officers, but not for their families. Married second lieutenants, in addition to the above, will receive commutation of quarters amounting to $24 per month, making their total compensation $165.67 per month. Officers are required to pay for food and clothing.

Upon entering the school, candidates will not be allowed to keep in the barracks any luggage but a handbag or a barracks bag. They should not bring trunks with them. Civilian clothing may not be worn at the school, and must be sent home after arrival or otherwise disposed of. All applications should be addressed to Field Artillery Central Officers' Training School, Camp Zachary Taylor, Louisville, Kentucky.

Utah Mining Congress Offers Views On Proposed Western Wage Regulations

The following telegram was prepared by a committee appointed at a meeting of Utah mine operators on July 29 and was immediately forwarded to W. B. Wilson, Secretary of Labor, at Washington, D. C. The committee consisted of G. W. Lambourne, Imer Pett, C. W. Whitley and L. D. Anderson.

At a meeting today of operators representing more than 90% of the metal output of this state, it was voted unanimously to submit for the consideration of your department our views with respect to proposed wage regulations affecting Western metal mines. The meeting was the result of the recent visit here of Verner Z. Reed and E. P. Marsh, of the President's Mediation Commission, who courteously granted an interview to a committee of metal-mine operators on July 27. The impression gained from the meeting and subsequent press announcements was that the mediators would recommend to your department that a zone be created embracing eight Western mining states, including Utah, Arizona, Montana and Nevada; that a uniform scale of wages be applied throughout this zone and that a Government commission be appointed to reinstate wage differentials with power to make its findings retroactive wherever necessary. The operators were urged by the commissioners to feel entirely free to present directly to your department any objection to their plan which from the operators' intimate knowledge of the business they might be in a position to make.

We are in sympathy with the suggestion to "set the price of labor," as the Government has fixed the price of our products, but we believe that the price of labor should be based on conditions where the labor is employed and not on conditions elsewhere. Realizing the complex nature of this problem, we suggest the careful consideration of the following points before any final decision be reached: First, Utah differs from Montana, Arizona and Nevada in that a great many of its mines are dependent on lead and zinc ores. Although the price of lead and zinc is low compared with copper, the lead-zinc mines are obliged either to pay the wage scale prevailing in the great copper mines of the state, face endless labor difficulties or close down. If required to meet the still higher wage scale of Montana, Arizona and Nevada, the only possible course for many will be to suspend operations. The numerous wage increases in Utah since the beginning of the war have already forced some mines out of business and made the situation of many others exceedingly precarious. The rate of output of lead and silver from the Utah smelteries has suffered a reduction of 15% compared with the corresponding period last year. A further curtailment will be the inevitable effect of a still further advance in their expenses. Second, the wage differential between Utah and Montana, Arizona and Nevada has always existed. This condition is due to natural causes and was created largely if not wholly by the miners themselves as the result of differences in climate, living conditions, character and surroundings of work and other circumstances. It is not that the Utah operators are trying to pay a lower wage than is paid in other states, but, on the contrary, that the working miners of those states demand a wage differential as a premium to offset what the miners themselves have determined to be less favorable living and working conditions in Montana, Arizona and Nevada. Third, the wage scale of the Utah mines is already disproportionately high as compared with the scales established by the Government for identical labor in shipyards and on railroads. To again change the mine rates will cause a tremendous upheaval in the entire industrial organization of the states affected, cause extreme dissatisfaction among the Government railroad employees and plunge the whole labor question in all of the Western mining states into chaos.

We feel that these consequences would have been foreseen by the Presidential Mediation Commissioners had they had time to familiarize themselves with all phases of the situation and that their recommendations would then have been different in many respects. We would respectfully request that you acquaint Messrs. Reed and Marsh, as well as the boards of your department which may be interested, with the contents of this statement.

Every one present at our meeting was deeply sensible of the disinterested and patriotic purpose of the mediators and of your department, and it was the universal desire to aid in every way possible in stabilizing the industrial situation. All wished to deal as generously with their employees as was consistent with the maintenance of the production and financial support required by our country in these crucial days.

Metal Production of Western States

Advance figures for the mine production of gold, silver, copper, lead and zinc in 1917 by the states of Arizona, California, Utah, Oregon and Washington have been compiled by the U. S. Geological Survey. In the original tables from which the accompanying compilation has been made the production is given for each county.

METAL PRODUCTION OF WESTERN STATES

	Arizona	California	Utah	Oregon	Washington
Number of producers	484	*a*	334	76	136
Ore produced, tons (2000 lb.)	15,770,193	3,003,250	15,358,481	142,438	172,119
Gold, oz.	245,173	971,734	162,305	72,165	23 816
Silver, oz.	6,983,913	1,775,431	13,479,133	125,656	282,320
Copper, lb.	712,166,891	48,153,139	246,674,153	2,474,487	2,199,518
Lead, lb.	23,465,445	21,868,628	178,521,958	(*a*)	9,789,687
Recoverable zinc, lb.	20,894,860	10,872,716	21,286,871	(*a*)	1,195,567
Total value	$209,393,802	$37,685,985	$99,328,155	$2,270,874	$2,289,285

(*a*) Information not given.

Verbal Modification of Written Leases

BY A. L. H. STREET*

Under the statute in force in most states, to the effect that an agreement not to be performed within one year is not enforceable unless evidenced in a writing signed by the person to be bound, modification of a mining lease by reducing the royalty to be paid should be stated in writing. But, under uniform rulings of the courts that where one party to an agreement has materially performed his part of the contract this will cure original invalidity of the agreement arising from want of written obligation, an oral modification of a mining lease will be sustained in favor of the lessee where, on the faith of the modification, he has sunk shafts and paid royalties. The points were decided by the Springfield, Mo., Court of Appeals, in the recent case of Last Chance Mining Co. *vs.* Tuckahoe Mining Co., 202 *Southwestern Reporter*, 287.

*Attorney at law, 820 Security Bldg., Minneapolis, Minnesota.

Editorials

Labor's Responsibility

THE reports of railway operations under Governmental direction furnish food for serious reflection. In spite of the advantages theoretically derivable from coördinated management—which were the basis of optimistic hopes and promises six months ago—the railways are making a poorer financial showing than they were previous to the taking-over. The reason is increased costs, especially for labor. The income from the increased freight and passenger rates has not yet exhibited itself in the reports, however.

But here we have an expression of what is going on in all industry. Labor demands and gets increased wages on the ground of increased cost of living. Then the products of labor—food, hardware, transportation and everything—have to be advanced in price, and the cost of living rises further. So things go around in a vicious circle. The price-fixing policy of the Government does not stop it, but rather aggravates it. When the Government itself takes over an industry, for example transportation, it finds itself obliged to advance prices in just the way that it refuses to let the producers of commodities do. Who can shut his eyes to the prospect that a continuance of this policy will break down production, just as it broke down transportation?

This is labor's day. The demand for labor is great and the supply is short. Labor is economically justified in taking advantage of this situation and getting all it can. But labor is making its great mistake in not taking advantage of its opportunity by working hard and saving. Never before, in the history of the world, did labor have such a chance to rise in the economic scale, to better its conditions of living, to provide against sickness and old age. Many workers appreciate this and are acting accordingly. But too many, in every industry, find in high wages and great demand for their services the excuse to work only part time and to work inefficiently. Complaints of company managers that they have to keep 15,000 men on their payroll in order to get the work of 10,000 for full time, and that the output per man even on full time has diminished seriously, are far too common. The evidence respecting this subject is too sweeping and too conclusive to permit of there being any mistake about it.

This disastrous situation results from interfering with the law of supply and demand in the case of capital and keeping hands off in the case of labor. The aim is by price-fixing to restrict the earnings of capital and to tax severely what can be realized, while those of labor are unrestricted and untaxed. This theory disregards the elemental facts that capital works all the time and constantly studies to improve efficiency, creating annual savings that go to swell the wealth and power of the nation, while labor wastes, both in extravagant consumption and in failure to produce efficiently and by indulging in idleness.

Appeals to patriotism have ameliorated this evil in the cases of shipbuilding and coal mining and no doubt in other things. An offsetting factor also is the constant effort of the administrators of industry to increase the mechanicalization and efficiency of their methods, although the shadow of the tax gatherer is an ever-present, deterring influence. But everybody knows that the general attitude of labor is that of indifference and slackness, not owing to any lack of patriotism (quite the contrary), but due to ignorance of the fundamental principles of economics and, unfortunately, to human nature. The opportunity of labor to improve its working conditions is something to be viewed with approval. The opportunity of labor to increase its wages is something that is economically natural and beyond cavil. But the wastefulness of labor, especially of its time, and the indifference of labor, especially in its interest, are things that cannot be condemned too strongly. Already there are pessimists who say "Labor is going to get all." If it ever succeeds in that it will find that it gets nothing. Such an economic demolition as that of Russia is the only outcome of such a course.

Some states have passed laws to the effect that "all able-bodied men between the ages of 18 and 50 must work at least 36 hours each week at some useful occupation," under penalty of $100 fine, or three months in jail, or both. But why only 36 hours per week and not 44 or 48? Does not the 36-hour provision legalize the mischievous habit of part-time work, which is so emphatically playing into the hands of the Huns?

The American Zinc Institute

THE meeting of the zinc producers of the country in St. Louis last week, at which steps were taken to organize an American Zinc Institute, was in all respects successful. It brought together both miners and smelters, who came from all parts of the country, and sheet-zinc rollers as well, and enabled them to become acquainted with each other and discuss the problems that concern them all. In the present condition of their industry, these problems are serious, and they must have careful consideration, to be followed by joint action in the proper directions, if serious disaster is to be averted.

A pleasing thing about the recent convention was the good-fellowship that was exhibited and the moderation of thought that was expressed. There was no haranguing about grievances between miners and smelters, no invocations of Governmental assistance in the way of price-fixing or otherwise, and no talk about forming a sort of a cartel and regulating production, even if the Government might be disposed to connive in such an illegal proceeding. On the contrary, the keynote was distinctly for nothing but legitimate coöperation in the direction of research, experimentation and increasing the use of the product; and, in another direction, the

increasing of efficiency in production. These are the straight paths that have a sound economic foundation and are free from pitfalls and quagmires.

The zinc industry can do much for itself in these ways. The prime question that comes first before it is for the organizing committee to frame a broad constitution and a simple system of business procedure. The next great question will be for the board of 21 directors, representing the whole industry, to decide whether it is going to approach the problems in a big way or a little way. If they are well advised they will choose the former, remembering the adage of "Nothing venture, nothing have," and remembering, further, that these are days when time is too precious for any of it to be lost by dilly-dallying.

Captain Irving

PROFESSOR KEMP and Professor Lindgren have fittingly furnished the memorials of the good gentleman and gallant soldier of whose loss we heard last week. It was proper that these should be written by fellow-geologists who were very near to him and could esteem his professional attainments better than any one else. But the entire craft of mining engineers knew of him and gloried in his being an officer in the 11th Engineers, which was one of the first regiments to go over and distinguished itself so famously at Cambrai. The thought that we shall not see our friend again cuts another wound in our bosoms, such as we felt when we heard of the death of Lieutenant Hague. These wounds, and others yet to come, will heal, but that we have had them will be an inspiration to all of us, and the memory of these friends will linger with us as flowers of chivalry.

War-Time Economies

IT HAS long been realized that charcoal would precipitate gold or a gold compound from aurocyanide solution; but, in spite of the low first cost of charcoal and the comparatively high cost of zinc, practically nothing has been done to adapt the cheaper material as a precipitant. The money spent on research along practical lines in the metallurgy of gold has been insignificant, and nearly all the advance made has been due to the individual and unaided efforts of a few metallurgists who have made time, in the midst of their complex duties, to devote to research. It was, however, only when the cost of zinc became almost prohibitive that two metallurgists set to work and evolved a scheme for using charcoal satisfactorily, in place of zinc or aluminum. The Moore-Edmands process, described in this issue, resulted; and, although initiated as a war economy, it is reported to give better precipitation than the zinc or aluminum method, with a greater saving of gold, and cleaner solutions, with an economy of chemicals. A sound objection will be advanced against the use of charcoal in any known system, in that the silver, often associated with gold in nature, is not precipitated satisfactorily. The objection is insufficient to condemn the new process, and there are doubtless many institutions where research is being carried out and where the problem might be solved, if this is not done by private individuals.

Precipitation with lump charcoal had undesirable features, and the majority of metallurgists were complacent in their convictions that there was no possibility for successful application. In most cases zinc was giving good results; in others, the more expensive aluminum was used. When difficulty was experienced it was considered inevitable, and the wasteful addition of cyanide, to a degree far above that needed for the effective solution of the gold, was frequently advocated to mitigate precipitation troubles.

Besides the introduction of charcoal as a precipitant, other instances could be cited to prove that economy is not invariably its own reward. The results are often far-reaching in their economic significance, and beyond the vision of those whose conception of efficiency is to get the most at the least expense. Economical traits should be encouraged to the utmost, both for the value of the habit acquired and for the gain in net results, which often extends far beyond a saving in money or material.

The Demand of the Gold Miners

THE gold miners of the country are going to meet soon at Reno, Nev., to discuss the serious situation in which they find themselves. It looks as if their ideas would crystallize in a demand for a bonus of $10 per oz. upon gold production. As compared with the increased cost of labor and supplies, that is modest enough, although, if taxation be also abated, it may not be so bad. However, the asking for this is one thing and the getting of it is another.

It is clear that if aid be not extended to the gold miners the production of gold will decline very rapidly. The economists and financiers will have to decide whether they are willing that should happen, or not. Our own Treasury Department has already expressed itself very emphatically in the negative, but it has not said whether it wants to keep gold mines in operation sufficiently to pay a bonus to them.

In a previous article on this subject we pointed out that the payment of a bonus on new gold production would be equivalent to creating a premium for gold. It might, however, be managed so that the condition would not necessarily be such. Thus the Government might enter into an agreement to pay to what are distinctly gold mines a bonus of $10 per oz. upon their production, not to exceed the average annual rate of a series of recent years. In some such way clandestine deliveries might be excluded and the plan be resolved into a class subsidy, analogous to what there used to be on certain steamship services. The whole thing might be unsound and uneconomic—indeed would be—but in these days we have come to think that in many bad practices the end justifies the means.

Socialism and Sedition

NATURE is a hard task-mistress. She has never let it be easy for people to get their living. Since the appearance of the human race on this planet, it has had to struggle for existence. The struggle was harder, and there was more anguish and suffering, in the Stone Age than there is now. But, although conditions on the whole are easier in the 20th century than they were in the 19th, and the same may be said of the previous centuries in precession, there are many people, probably the

majority, who have a hard time of it, Heaven knows; who are unhappy, who excite the sympathy of the kindly hearts among the classes that are more fortunate. But sentiment cannot be allowed to run away with common sense, without courting economic and national disaster. The proletariat and sentimentalists may rage against capitalism and pray for abolition of the system. But overthrow the system, reduce the captains of industry and the subordinate leaders to the ranks, then the mass of the people would soon starve to death, for they would not know what to do. Look at Russia, where leadership has been discarded, where deliberate efforts have been made, not only to extinguish property rights, but also to eliminate the intelligent classes of people, lest once more they may rise in position and prosperity above the masses.

In the United States there is nothing that prevents any one from rising to the top. Most of our great industrial leaders are men of humble ancestry, who began work in overalls, but who worked hard and used their brains. Most men do not use their brains; most men do not even want to work. The root of economic evil in this country today is that too many men will not work full time. There is too much of the four-days-per-week idea, instead of six days and full efficiency. There is too much poisonous socialistic nonsense, which is operating to reduce our national efficiency. Karl Marx, a German, created the germs of this infection. The Hun leaders propagated them and disseminated them among foreign countries, taking good care to suppress them at home. It was a shrewdly malevolent policy, and appreciating that, we should combat it. Socialism and sedition, in these days, are pretty much the same thing.

BY THE WAY

The letter to his friends which D. M. Riordan composed upon the approach of his 70th birthday, and which we published in this column of the *Journal* of July 9, inspired one of his friends to address to him this splendid combination of philosophy and poetry:

My dear friend:

In the days when grouches are in order, when we are complaining because the Government needs our boys and our money and is taking both; when we are very sad if we have no money or boys to give; when we kick if we have to go ourselves and damn our luck if we are too old and infirm to go, it is good to see a little sunshine playing over the old rockpile and to feel that there is still some optimism in the air. It is good to know that there is one fellow, who, having seen all sides of life, having seen the ore pinch out in the bottom and every blooming face in waste, is now smiling and by example telling us to pack our troubles in the old kit bag and forget them; is telling us that the pinches are only local, and never mind how long we have worked, we've got 20 years of good going ahead of us. I say it's good to be poked in the ribs by such a fellow and poked hard, too.

Your letter of appreciation to the Almighty reminds me that He stakes out the claim that we must work, and darned unpromising the claims sometimes appear on the surface. But if we will only work them with the tools that He has given us, it will be found that they are all pretty good claims, after all, and that the mint returns are just about in proportion to our work. Some of us surely make a darned poor fist of it. We are inclined to fool ourselves; we get out a lot of rock and keep the stamps a-dropping and making the devil of a noise; we put on lots of quick and rub the plates hard and make big clean-ups. But in the end the amalgam must be retorted, and, while we may have fooled ourselves with the stuff we have put away in the safe, we can't fool the Lord. If we have done poor work, there will be nothing but copper and dirty sulphides to hand in. If we have been men and done the work of men, there will be a little bar of gold, and the Father will say "Well done, thou good and faithful servant. Enter thou into the Kingdom of the Lord."

It is my hope that I will not have to try to fool the Lord, but that I may have just a little of the real metal in my bar—enough to get through the Gates; so that when D. M. Riordan walks in wearing a nice new Stetson and expert boots he will say: "Well, bless my soul! How the hell did he get here? It's sure enough my old friend B——."

This is the sort of talk that the young fellows ought to treasure. The oldsters appreciate it, for they know that it embodies the essence of experience, the sterling silver of friendliness and the refined gold of character.

There are some people in the financial district who are of the opinion that, before attempting to take the beam out of the eye of the profiteering meat and steel and copper trades, the Government had better take a look in the glass to see whether or not there is a mote in its own eye, says the *Evening Post*. If that is done in the case of the railroads, some people are declaring, the Government will find that it is doing the very thing that is being charged against the wicked meat, steel, and copper makers.

As an indication of what is possible in the conversion of industry to meet war requirements and of the changes which can be made in the product of a factory, a few radical instances are given as illustrations by the War Industries Board. For instance, a Pennsylvania factory that formerly made linoleum is now machining 4.7-in. shells. A Duluth horseshoe manufacturer is turning out trench picks for the Army, and a New Jersey terra-cotta tile concern is making dummy drop-bombs. A Milwaukee factory, the former output of which was rowboat motors, is making hand grenades and trench pumps. In Rhode Island, a manufacturer of finger rings has turned his activities to making adapter plugs. A Detroit stove concern is producing trench bombs and anchor parts, and a New York shirt waist manufacturer is making signal flags.

A mining engineer was working a laborious passage across the Mexican Sierras on muleback, accompanied by a *mozo* whose taciturnity he was unable to influence. The American's knowledge of Spanish was scant, as he was new to the land of *tortillas* and *frijoles*, and all his efforts at conversation were abruptly terminated by the Mexican's *"mañana"* (by and by, tomorrow) in reply to all questioning as to when they would reach their objective, or *"quien sabe"* (who knows) in answer to all other inquiries. Chancing to pass through a mountain village they found that a funeral was in progress. The *mozo* held an animated conversation with several acquaintances, apparently anent the sad occurrence. Seeing what appeared to be a favorable opportunity for conversation, the American asked him who was dead. *"Quien sabe?"* was the reply. The American thought a moment, and then added: "Would that *mañana* could die too."

Personals

Have You Contributed to the Association of the 27th Engineers?

Kirby Thomas, of New York, is making examinations at Sudbury and Gowganda, Ontario.

G. H. Bolin, state mine inspector for Arizona, has returned to Phoenix from Los Angeles.

A. P. Watt has been elected to membership of the Mining and Metallurgical Society of America.

John A. Percival, of New York, is expected early in August in the Pacific northwest, and will inspect mines.

Herbert G. Officer has been commissioned a second lieutenant, Aviation Service, and is now on duty at Washington.

W. H. Howard returned to Salt Lake City recently after a long trip through the Southern States and those of the Pacific Coast.

A. E. Drucker has recently completed a series of leaching and electrolytic zinc investigations for the Consolidated Interstate Callahan Mining Company.

E. Redding, formerly with the Chino Copper Co. at Santa Rita, N. M., has accepted a position with the Oliver Iron Mining Co., Eveleth, Minnesota.

Jerome L. Drumheller, of Spokane, is in Alaska inspecting the initial run of a dredge for gold and platinum recovery on Willow Creek, Susitna River.

B. B. Gottsberger, general manager for the Miami Copper Co., recently left Miami, Ariz., on a vacation trip to Los Angeles and other coast points in California.

H. L. Ellis has been engaged on development work for the Bunker Hill & Sullivan Co., in the Heath district, central Idaho, and was recently in Homestead.

James S. Douglas, who has returned from France, where he had been for about a year engaged in Red Cross work, was recently at Phoenix, Ariz., en route to Jerome.

Frederic Keffer has returned to Spokane, Wash., after having been in New York a month investigating a new electric process for the production of nitrates and ammonia.

J. S. Coupal, of the Engineering Management Corporation, New York, has just returned from a three months' trip in Venezula on investigations of magnesite and copper properties.

P. C. Carmichael, formerly captain of the Alexandria mine at Chisholm for the M. A. Hanna Co., has been appointed superintendent of the Hobart mine, at Gilbert, Minn., for the same company.

D. McKenzie, until recently superintendent of the Ruth-Hope mines, Slocan, B. C., has taken charge of work begun by the Rosebery-Surprise Mining Co. on the Ivanhoe group of mines, near Sandon.

Oscar V. White, for many years superintendent of the Slocan Star silver-lead mine at Sandon, Slocan, B. C., is now directing development work on the Wakefield property, near Silverton, British Columbia.

Van H. Manning, director of the Bureau of Mines, has returned from a trip to Montana impressed with the achievements of the Anaconda Copper Mining Co. with its new ferromanganese smeltery at Great Falls.

N. O. Lawton, general superintendent of the Vermont Copper Co., South Strafford, Vt., is examining mining properties in Pennsylvania this week and will be in New York City for a few days on his return to Vermont.

L. C. David, general superintendent for the Quinn Companies on the Mesabi and Cayuna ranges, has resigned, and will accept a position as assistant general superintendent for the Pickands Mather Co., with headquarters at Gilbert.

E. B. Mamross, of San Francisco, recently went to the Cork Province silver-lead-zinc mines, near Kaslo, West Kootenay, B. C., to make final adjustments of the Minerals Separation flotation plant recently installed there.

Nelson B. Gatch, formerly superintendent of the Granby Mining and Smelting Co.'s operations in the Joplin district, and later general manager of the Miami Zinc Co., is now a lieutenant in the aviation branch of the U. S. Signal Corps.

W. J. Elmendorf, of the firm of Campbell, Wells & Elmendorf, mining engineers of Seattle, Wash., has been appointed as consultant to the Bureau of Mines, with particular reference to the development of war minerals in Washington and Alaska.

Clarence Hall has been appointed chief of the newly created explosives division of the Bureau of Mines. For a number of years Mr. Hall was chemist for the Aetna Powder Co., and, until recently, president of the National Chemical Manufacturing Co., of Pittsburgh.

W. H. Nicholl, formerly underground manager of the Lonely Reef Mine, Rhodesia, is with the Royal Engineers on the western front. Mr. Nicholl served through the African campaign, and, after the disbanding of his regiment, volunteered for active service in Europe.

T. Griffith Taylor has received the David Syme research prize, awarded in Australia, for a thesis based on the correlation of Australian physiography, meteorology and climatology. Dr. Taylor's work in geology is also well known, especially in relation to the glacial geology of Antarctica, which he studied while a member of Captain Scott's expedition.

H. R. Edmands, who, in conjunction with **K. Byron Moore,** developed the method of precipitating gold from cyanide solutions by the use of pulverized charcoal, sailed from Western Australia for South Africa, after having completed a charcoal precipitation plant at the Riverina South gold mine. Mr. Edmands has accepted a position with the Globe & Phoenix Gold Mining Co., Ltd., of Rhodesia.

Captain William J. Richards, during the last 18 years general superintendent of the iron ore mines of the McKinney Steel Co., on the Menominee and Gogebic ranges, has retired from active service, but will continue his connection with the company in an advisory capacity. He has been succeeded by Emerson D. McNeil, who was in charge as general superintendent of the properties of the McKinney Steel Co., on the Mesabi range, Minnesota.

Obituary

Chauncey P. Goss., Sr., president of the Scovill Manufacturing Co., died at his home in Waterbury, Conn., on July 19, aged 80 years. He entered the office of the Scovill company in 1862 and had been president and treasurer since 1900.

Edgar A. Fisher, Lieut. A. E. F., was drowned in France early in July. Lieut. Fisher was a mining engineer and was connected, at various times, with the Ray Consolidated Copper Co., the Braden Copper Co., and the Cerro de Pasco Copper Corporation.

Henry Shaler Williams, emeritus professor of geology at Yale University, died in Cuba on the 31st ult. He was born in 1847, and two years after being graduated from Yale, in 1868, became professor of natural science at Kentucky University. From 1892 to 1912 he was professor of geology at Yale. Professor Williams contributed extensively to geological literature and held the position of associate editor of the "American Journal of Science" and the "Journal of Geology," and he was actively concerned in the development of the oil fields of Cuba.

Societies

The American Mining Congress announces the holding of a meeting at Reno, Nev., Aug. 12, 13, and 14, to discuss the crisis in gold production, to consider the most suitable method of relieving the plight of the gold producers and at the same time insure the maintenance of the industry.

A meeting was held recently at the Engineering Societies Building, 29 West 39th St., New York, at which Capt. W. H. Stayton, U. S. N. (retired), National Director of the Navy League of the United States, delivered an address on "Ships," and dealt with the vital question of adequate shipping and the successful prosecution of the war.

The American Institute of Mining Engineers and other societies coöperated in the holding of a memorial service for the late John Duer Irving, professor of economic geology at Yale, who died on active service in France recently, at the Columbia University chapel on the 4th inst. Professor Kemp delivered an address, and a uniformed detachment from the School of Mining Engineers and a unit from the 265th Electrical Engineers were in attendance.

The National Research Council, acting as the department of science and research of the Council of National Defense, has appointed a committee to investigate the fatigue phenomena of metals. Professor H. F. Moore, of the engineering experiment station of the University of Illinois, is chairman. The committee is charged with the responsibility of developing a knowledge of the strength and durability of metals subjected to repeated stresses, such as ship structures, crank shafts of aircraft engines, and heavy ordnance. It is expected that much of the experimentation required will be done in the laboratories of the University of Illinois at Urbana under the personal direction of Professor Moore.

Industrial News

Dorr Company removed its New York offices to larger quarters in the Architects' Bldg., 101 Park Ave., on August 1.

George A. Armes, until recently chief engineer of the Union Iron Works Co., San Francisco, is now with the Moore Shipbuilding Co., Oakland, California.

The "Revista Mark R. Lamb" has taken the place of the "Revista Minera." The current issue contains much information with regard to mining equipment and products of special interest to South American mining operators. The "Revista" is printed in Spanish.

The Cottrell Engineering Co., of Los Angeles, has brought out a dry concentrator which has attracted attention in the dry mining districts of California and Arizona. The machine introduces a new principle of air flotation, supplementing a high-speed jigging motion; and simplicity of construction, economy of operation, and high metal extraction are claimed. The company, which manufactures both dry and wet concentrators for its own use, will soon begin operations on a silver-lead property near Tucson.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Antifriction Bearing—Orlando W. Hart, Fall River, Mass. (U. S. No. 1,270,821; July 2, 1918.)

Cadmium-Evolving Process — Woolsey McA. Johnson, Hartford, Conn. (U. S. No. 1,271,172; July 2, 1918.)

Carbide: Process of Making High-Percentage Calcium Carbide—Duke Robert Russell, Chicago, Ill. (U. S. No. 1,271,229; July 2; 1918.)

Electric Furnace—Edgar F. Collins, Schenectady, N. Y., assignor to General Electric Company. (U. S. No. 1,271,280; July 2, 1918.)

Furnace Lining—Otto Joseph Thomas Gustave Richard Martin, Vancouver, British Columbia, Canada. (U. S. No. 1,271,052; July 2, 1918.)

Holder for Miners' Lamps—James M. Roberts, Fredonia, Ky. (U. S. No. 1,271,368; July 2, 1918.)

Mining and Loading Machine—Edmund C. Morgan, Chicago, Ill. (U. S. No. 1,271,197, 1,271,198 and 1,271,199; July 2, 1918.)

Smelting and Refining Furnace—Otto Joseph Thomas Gustave Richard Martin, Vancouver, British Columbia, Canada. (U. S. No. 1,271,051; July 2, 1918.)

Refractory: and Process of Making Same—James O. Handy and Robert M. Isham, Pittsburgh, Pa., assignors, by mesne assignments, to Allen S. Davison Company, Pittsburgh, Pa. (U. S. No. 1,270,818 and 1,270,819; July 2, 1918.)

Roller Bearing—Orlando W. Hart, Fall River, Mass. (U. S. No. 1,270,820; July 2, 1918.)

Rotary Pump—Albert Edward Shiner, London, England. (U. S. No. 1,271,377; July 2, 1918.)

Tailings-Disposal Apparatus—Irwin S. Clifford and Fred C. Tompkins, Miami, Ariz. (U. S. No. 1,271,134; July 2, 1918.)

Tin Smelting—Method of and Apparatus for Smelting Tin—Edmund N. Morrill, Warren, N. H., assignor to Andes Exploration and Smelting Corporation. (U. S. No. 1,271,200; July 2, 1918.)

Tungsten Manufacture—Production of Metallic Tungsten Powder. Frederick G. Keyes, East Orange, N. J., assignor to Cooper Hewitt Electric Company, Hoboken, N. J. (U. S. No. 1,270,842; July 2, 1918.)

Editorial Correspondence

SAN FRANCISCO—July 29

Economical Spacing of Oil Wells was the chief subject of discussion at a recent meeting of operators at San Francisco. The consensus of opinion was that four acres to the well is too small an area for economical expenditure of materials and labor. The maximum space considered was 10 acres, and that will probably be the area ultimately determined upon. The fact was plainly brought out that no definite planning had been done by operators, although this branch of the oil-well industry involves the expenditure of large amounts. The subject is held to be of sufficient importance to require further careful discussion and consideration.

Fires in the Klamath National Forest, in Siskiyou County, now under control, numbered more than 100 from June 9 to 12 and did approximately $150,000 damage. They were started by electrical storms and were as numerous as is usual in August, owing to the exceptionally early dry season. The number of men available for fire fighting has been greatly reduced by the war demands, and this is in a measure responsible for the early start of the fires. Indians in the region gave valuable aid. In the Shasta Valley region, west of Marble Mountain, the June fires were less damaging, as they were confined chiefly to the smaller growths. Owing to the isolation of the region and the cost of securing men and materials, the principal efforts of the forest supervisors were confined to the saving of the timber-size growths. Reports of incendiary origin of the fires had no foundation in fact.

The Natural Soda Products Co.'s Plant on Owens Lake, Inyo County, lost its main building by fire on July 7. A 50,000-gal. tank that was to be used for storing water for fire-fighting purposes, but had not been connected by pipes, owing to shortage of labor, was also destroyed. A concrete oil tank, filled with oil, and a number of carbonating tanks, eight furnaces, four lime kilns, a boiler house and a pile of coke valued at $10,000 were saved. The company carried $100,000 insurance on the entire plant. There is also insurance of $400,000, covering use and occupancy, so that some return will be made for loss of operation while the plant is being reconstructed, which will require six or eight months at least, owing to the delay in obtaining materials and machinery. The buildings will be reconstructed of concrete, which will greatly reduce the fire risk, so that the permanent loss is confined chiefly to the portions of machinery destroyed and the loss of production caused by delay in resuming operation. The output of the plant had been increased from about 4000 tons in 1916 to a possible 25,000 tons in 1918. The company employs 100 to 150 men, who will lose no time during reconstruction.

Road Construction to Chrome Regions of Smith River, Del Norte County, is under investigation by Albert Burch, of the War Industries Board, and his assistant, Mr. Caldwell. Some extensive road building has been carried on at the expense of chrome miners in this region, and it could be improved by Government or state aid. It is understood that the Government will, in so far as legally possible, give assistance to the miners of the special war minerals, in the matter of roadbuilding. The state might have done more of this sort of work in the expenditure of the $18,000,000 road fund if the political disposition of the manipulators of state funds had leaned more toward the encouragement of mining industry in the state than toward the advancement of the automobile industry out of the state. But it is hardly to be expected that the politicians should give more heed to the requirements of the mining and other industries of California than to the demands of tourists. The miners they have always; but the tourists they have not, unless they go after them. And just now, the Government is advising the curtailment in public improvement expenditures. So, if the miners require roads to get their ore or metals to shipping points, let the Government build them.

Relief of the Gold Miners of California is announced in the daily press to be a part of the summer programme of the State Mining Bureau. The state mineralogist purposes to come to their assistance by collecting the necessary data relating to the expense of gold mining and submitting the facts to the Secretary of the Treasury, with the object of securing relief. If the results of the data-collecting campaign can be made to show that the cost of mining gold is greater than the cost of mining other metals, or will evolve a method of increasing the purchasing power of gold without reducing the costs of all metal mining, the Secretary of the Treasury may receive some interesting figures from the state mineralogist. There is no questioning the fact that the gold miners have been hard hit by the high costs of labor and materials. Nor is there any doubt that gold is an essential product in time of war, as in time of peace. No one has disputed these facts. Indeed, the Government has declared gold to be an essential. But the evil cannot be cured by collected data on costs of gold mining. However, the miners of gold know the cause of the present condition of the industry. They know it to be the result of a combination of causes: the high cost of labor and materials and the low purchasing power of gold, together with the propaganda that has persistently set forth the idea that the Government intended placing gold toward the bottom of the list of essential minerals and metals. In fact it is, as the mine owners are well aware, near the bottom of the list of industrial metals. The owners of gold mines know they are confronted by a most difficult combination of conditions. And they know, further, that the Government cannot make labor nor materials any cheaper for gold mining than for copper, lead, manganese or any of the other metals and minerals. Apparently the state mineralogist thinks the gold miners are merely handicapped by the high costs of mining, and that if he will tell the Secretary of the Treasury all about it, the Secretary of the Treasury will put an immediate stop to the absurdity of making the gold miner pay as much for his labor and materials as the copper miner pays. But when he presents his data and is asked how much greater is the cost of gold mining than other metal mining, he may wake up to the fact that he has been spending state money for collecting a lot of useless figures. Of course it is possible that some of the smaller mine owners may be impressed with the idea that the State Mining Bureau is going to relieve them of some of the "enormous expense." But even that is doubtful. So it is not likely that the result will be an appreciable gain in votes for the gubernatorial candidate most favorable to keeping the present state mineralogist on the job. The state mineralogist is reported to have suggested still another method of relief—the subsidizing of gold production. That would be much better and much simpler. At any rate not any more foolish. And it would have the merit of saving the state the unwarranted expense of collecting useless data.

DENVER—Aug. 2

Leasing Operations in Colorado mines may be curtailed during the coming year on account of the steadily increasing freight rates, smeltery charges, cost of supplies, and the demands of the excess-profits tax. Last year's metal output in Colorado compared favorably with the value of the agricultural products, but this year many mining operations, which involve the risk of capital in underground development, will prove less attractive on account of the factors conspiring to cut down the profits properly demanded in connection with speculative ventures. Prior to Government control of railroads, some of the transportation companies succeeded in raising freight rates on ore hauled from the mines to the smelteries. Following Government control of these same roads, an additional raise in rates was made, in some cases amounting to considerably more than 25% of the old rates. The smelting charges then increased from 30 to 45%. These increases, together with the great increase in cost of mine supplies and labor, were accepted by mining men as necessary evils at this time, and an effort has been made to make the best of the situation. However, the excess-profits tax is so designed that in the case of leasing operations where there is little or no capital invested the Government at once requires 60% of the net earnings of the lessee. Mining men are trying to secure some relief from this situation, and are attempting to obtain a special ruling through the Internal Revenue Office to cover the case of mine leasing. The problem appears to be the making of an estimate of the amount of capital that would have been invested by the lessee if it had been necessary for him to sink a shaft to the depth of his discovery and perform the development necessary to make his orebody available for extraction. This estimated expense would constitute the lessee's capital investment, and the excess-profits tax could be adjusted upon that basis. Operators understand that there is no immediate relief, but that the tax must be paid according to the law, with the hope that an adjustment may be secured later through an appeal in Washington. As to the present freight rates, it is admitted that some of them are too high, and the question of an adjustment is pending before a sub-committee of the Freight Traffic Commission consisting of H. A. Johnson, John Vallery and Fred Wild, of Denver, and J. C. Burnett, of Topeka.

A Bonus on Gold is to be the subject for discussion at a joint meeting of the Colorado Chapter of the American Mining Congress and the Colorado Metal Mining Association to be held in the office of the latter body in the Tabor Bldg., Denver, on Aug. 8. Constant decrease of the amount of gold produced in this country has spurred the Government to take cognizance of a situation that mining men have foreseen for several months. Government officials now realize that gold mining is not a non-essential industry, and that a continued decrease in gold production might result in actual peril to Federal credit. Recently, all the large gold-producing companies of the country have received a telegram from the Bureau of Mines seeking accurate information regarding the present status of the gold-mining industry. The telegram is as follows: "The committee formed by the Secretary of the Interior to study the gold situation asks your earnest coöperation, and requests that you prepare to provide promptly a complete yearly statement for the last five years, showing detailed operating costs, number of tons treated and the recovery; also production and costs for the six months of 1918, and the estimated production for the whole year; also a detailed statement showing how costs have increased, and what, in your opinion, can be done by the Government to assist gold mining. All statements will be treated as confidential, for Government purposes only, and accuracy is absolutely necessary. All figures given must be subject to confirmation afterward. Letter and blank follow. Hennen Jennings, Chairman, Bureau of Mines." At the meeting to be held in Denver the mining men will decide what they shall expect of their delegates at the meeting to be held at Reno, Nev., Aug. 12, 13 and 14, at which all the larger mines and associations of metal producers will be represented. The Reno meeting was called by Governor Emmet D. Boyle of Nevada. It is probable that at that time the mining men will recommend that the Government place a bonus of $10 per oz. on all gold produced, and also abolish all Federal and excess-profit taxes on mining development. It is claimed that further production is hampered by such special taxes, and that to entice mining interests to undertake further development every inducement will have to be used. Mining men argue that all mine development is to some extent a gamble, and that the winners receive such a small profit that the taxes have completely discouraged all efforts to open new sources of gold production. In all districts where gold occurs in pockety deposits, requiring a relatively large amount of underground development work in proportion to the ore opened up for mining, practically no mining development is being performed. Many of the gold-producing camps of Colorado have lost from 25 to 60% of their population in the last year, through the closing of mines and the lack of profit in leasing operations under present cost of labor and mining supplies, and without a compensating change in the value of the product.

SALT LAKE CITY—Aug. 1

Cost of Production of Low-grade Ores in this state is being considered by the Utah Chapter of the American Mining Congress with a view of furnishing information to be placed before the War Industries Board. There is hope that relief will be granted in the matter in the raise of freight rates on ores. Other things affecting the mining industry will also be given consideration.

Utah Iron and Steel production at Midvale will soon reach 4000 to 5000 tons of steel bars monthly. This company is completing the installation of an additional openhearth furnace, and this is expected to begin operating about Nov. 1. The plant is being worked to capacity, largely on Government contracts, and the greater part of the product is shipped to the Pacific Coast for use in ship construction.

A Higher Wage Scale for the camp of Alta, in Little Cottonwood canyon (the advance amounting to 50c. per day), went into effect on Aug. 1, and brings the wage scale of this camp up to that in force at Bingham and Tintic, which is $4.75 for muckers and $5.25 for miners. Among the companies affected are the South Helca, Wasatch Mines, Michigan-Utah, Sells, Columbus-Rexall, and Emma Copper. A shortage of labor has been hampering the mines somewhat in their effort to bring to market the largest possible tonnage during the favorable shipping season, at present in full swing.

GOLDFIELD, NEV.—July 29

Underground Employees of the Goldfield Consolidated and other mining companies of this district struck for an increase of $1 per shift in wages on June 25. They had been receiving the same scale as before the war, and as living costs have increased at least 25%, their demands were not unreasonable. Before quitting work, the men gave the operators a reasonable period for consideration of their demand. No violence has so far occurred and none is expected. The operators argue that their present limited profits will not permit of such an increase in wages. A few of the smaller mines are again working after granting the men a bonus in addition to the old scale of wages. It is thought that Goldfield Consolidated will institute a combination of the leasing and bonus systems. About 300 men are idle, and many are leaving for other camps where higher wages are being paid.

JOPLIN, MO.—July 29

Installation of Skidoo Bells in the hoistrooms of all Oklahoma mines has been ordered by the state mine inspector. A law requiring this safeguard for the men underground has been on the statute books of the state for a number of years, but it has not been enforced. In recent months accidents have emphasized the need of enforcement, and the present order of the state inspector is the outgrowth of a feeling among the mine operators themselves and the miners. Installation of the bells will make it possible for the hoistman at any time to sound a warning to the men at the bottom of the shaft.

BUTTE, MONT.—Aug. 1

Mines of the Boulder River Chrome Co., 35 miles from Big Timber, in Sweet Grass County, on the Boulder River, and said to be the richest chrome properties in America, have been sold to Oscar Rohn, general manager of the East Butte Copper Co., for $500,000. Mr. Rohn will invest $200,000 in addition to the purchase price. It is said that the Boulder River properties are the only workable chrome deposits in the United States outside of California. Hitherto nearly all the chromium used in manufacture in this country has been imported from Rhodesia, New Caledonia and China.

DULUTH, MINN.—Aug. 1

Determining if Mining Companies shall pay the established state royalty of 25c. per ton on the lean ore or on the concentrates is the basis of a suit soon to be begun by the state and one which involves more than 25,000,000 tons of lean iron ore. To test the law the Pickands-Mather Co., operating the Majorca mine at Calumet, will begin mining a quantity of wash ore and then will offer payment of royalty based on the output of concentrates. The state auditor has refused to accept this and it has been decided that a suit will be started by the state against the mining company.

Two Hundred Striking Laborers from the Great Northern Allouez iron-ore docks were arrested July 30 on state warrants after refusing to await consideration of their grievances by the War Labor Board. Five hundred ore-dock workers struck June 27 after allowing the dock officials two hours in which to grant a raise in pay of about 10c. an hour. The docks are operated under the direction of the Railroad Administration, and it was impossible to grant the increase without Government sanction, officials said. Representatives of the Council of Defence, the railroad company and the Labor Council conferred with the strikers, asking them to return to work pending action in Washington.

An Association of Independent Operators among the Lake Superior iron-mining interests is being contemplated. Those promoting the movement draw attention to the fact that productions of independent operators are estimated to equal 25% of the entire output of Lake Superior district, yet so far they have not received adequate prices for their ores. It is claimed that the iron-ore price, for the last 14 years, compared with price of pig iron, has been a little better than 25%, whereas the present price is less than 15%. Though the recent advance of 45c. a ton is satisfactory to operators working open-pit mines, it is said to be entirely inadequate as applied to ores produced from underground mines, as it does not cover cost of production, which has increased during the last three years. As a result, some underground properties are being closed. Shipments, for example, have been discontinued from Cuyuna-Duluth mine on the Cuyuna range, because the present price of ore has made it impossible for the company to mine and sell its product in the open market.

SPOKANE, WASH.—July 28

A Gold Convention is to be held here at an early date to discuss methods of aiding production of that metal. If possible, Government representatives will be secured for counsel. Building of motor roads into inaccessible gold districts, remission of excess-profits tax and remission of the increase in freight rates on shipments containing gold ores are most favored here as means for aiding gold production. All gold districts of the Pacific northwest will be urged to send delegates.

General Labor Strike in the Slocan and Ainsworth mineral divisions of British Columbia was threatened by mining unions, but concessions by operators settled the issue. J. D. McNiven, Provincial wage officer, aided in securing a settlement. The men asked 50c. a day increase, a closed shop and eight hours a day for outside men. Operators agreed to the wage advance, but, in turn, will increase the board rate from $1 to $1.25 a day. They will grant an eight-hour day, but not the closed shop and will not collect union dues.

Continued Development of Magnesite Properties, steady shipments of copper, lead and silver, accompanied by discoveries of tungsten and chrome, all in Stevens County, have stimulated mining activities in all parts of this county, whose richness is just beginning to be realized. Attention has recently been directed to the Deer Trail section, in the southwestern part of the county, where two companies are shipping steadily and a third expects to be doing so early next month. One truck is making two trips a day from the High Grade mine, owned by the Reardon Copper Co., hauling three to three and a half tons a load. The distance to the logging road is 10 miles. The ore goes to the smeltery at Trail. Two trucks are hauling from the Deer Trail day and night, making eight trips a day, hauling about three tons to the load. The distance is about 12 miles to the logging road.

TORONTO—July 29

Increased Activity in the Boston Creek District in which there are now two producing mines, the Miller Independence and the Patricia, led the Temiskaming & Northern Ontario Ry. to establish a station service. The station buildings will be situated at Mileage, 153 miles from North Bay.

To Stimulate the Production of Platinum the Hon. Martin Burrell, Canadian Minister of Mines, has arranged for the purchase of platinum at the Dominion assay office, Vancouver, B. C. This will be a great convenience to miners, especially to small producers who have hitherto had to seek a market in the United States.

SUDBURY, ONT.—July 28

Prospecting for Platinum has been stimulated in the Ontario districts by the price of $105 an ounce and the reports of various platinum discoveries made from time to time, but which have been little exploited or investigated heretofore. The Vermilion gold mine, near Worthington, in the Sudbury district, at one time yielded considerable platinum in the ore. It was here that the then new mineral "sperryite," an arsenide of platinum, was discovered nearly 20 years ago. Platinum has been found south of Porcupine in a serpentine belt, and further search is being made of the serpentine area which extends north from Mattagomi Lake to the Frederick House river crossing of the Grand Trunk Railroad. Platinum is also reported as occurring in pyrrhotite near the Moose Mountain iron mine north of Sudbury.

The Mining News

ALASKA

ALASKA SHIPMENTS of domestic copper ore, matte, etc., to the United States during June were 11,229 gross tons, having a copper content of 3,980,197 lb. and valued at $937,166.

ARIZONA

Cochise County

HIGGINS (Bisbee)—Daily shipments of high-grade copper ore being made by leasers.

MARKS-MEYER (Bisbee)—Cut vein of copper glance and carbonate at 40 ft. in incline shaft.

Gila County

RAY HERCULES (Globe)—New mill installed has capacity of 1200 to 1800 tons per day.

FORTUNA (Miami)—Orebody cut by diamond drill carries silver, gray copper and lead. Tunnel in over 900 feet.

Greenlee County

ARIZONA COPPER (Clifton)—Copper produced in June was 3,700,000 pounds.

ASH PEAK EXTENSION (Duncan)—To sink to 300 level and crosscut vein. Ore carries gold-silver in quartz. Test car has been shipped preparatory to arranging for mill. John Horrigan is superintendent.

HARDY (Duncan)—Installed two Joplin-type jigs; shipping two cars manganese per month. Joe Hardy is owner.

PHILLIPS SPAR (Duncan)—Work to be started at once and shipments of fluorspar made to San Francisco and Chicago. James P. Porteus is consulting engineer.

Maricopa County

DRAGON (Wickenburg)—Mining equipment being installed.

Mohave County

WASHINGTON-ARIZONA (Kingman)—Shaft has been sunk. Vein to be followed to a depth of 500 feet.

MOSSBACK (Oatman)—Shaft has been retimbered.

Pima County

GUNSIGHT (Ajo)—Lead and silver ore struck at 160 feet.

NEW CORNELIA (Ajo)—New shaft has reached 250 ft. and station is being cut. New flotation plant has been started.

SWANSEA (Phoenix)—To add 200-ton flotation plant.

BULLION BAR (Tucson)—To be equipped with a small stamp mill.

Pinal County

PIONEER (Kelvin)—Additional mining equipment to be installed and development work continued through the old shaft.

TERRELL (Kelvin)—Important strike of gold ore made recently at 125 ft. Plans being made to install hoisting plant and make shipments.

TROY-ARIZONA (Kelvin) — Resumed operations Aug. 1. To work Alice tunnel and Buckeye shaft where sulphide ores were encountered many years ago. Work to be resumed in the Climax shaft upon arrival of new pumping equipment.

RAY SILVER-LEAD (Ray)—Control acquired by C. E. Addams. Working force increased and development of new orebodies being pushed. To double shipments soon.

SOUTH RAY (Ray)—Shipping carbonate ores to Hayden.

SILVER KING (Superior)—Regular shipments made to El Paso smeltery. Marcy mill being installed preparatory to treating large tonnage of low-grade ores on the dump.

Santa Cruz County

WORLD'S FAIR (Patagonia)—Equipment for 100-ton concentrating plant has been ordered.

Yavapai County

GADSDEN (Jerome)—Main shaft down nearly to 1200 level, where station will be cut.

GREEN MONSTER (Jerome)—Has abandoned work in Gorge tunnel. To sink Dorothy May shaft from 765 ft. to 1000 level and develop.

JEROME VERDE (Jerome)—Crosscutting from northeast drift of Columbia 1050 level to cut iron body shown by drilling.

ARKANSAS

Boone County

HARRISON (Harrison)—Rebuilding 75-ton mill recently burnt down and plans to purchase entire new machinery, excepting crushers. George Constant is superintendent.

GLORIA (Zinc)—Mill improvements to be made. Company has acquired new leases near mill and will build tram. George Miller is in charge.

WYERCOZIM (Zinc)—Has purchased lease on the Royal and other zinc mines from Boo-Gra-Loo Mining Co., and started operations.

Independence County

CLAUSE (Cushman)—Purchased by C. G. Shuman and M. L. Richards, of Chicago, and A. B. O. Dutcher, of Wichita, Kas., who will start erection of a washer immediately.

CALIFORNIA

Calaveras County

DAVENPORT MINES (Angels Camp)—Company organized to operate placer mines.

Eldorado County

TWIN VEINS (Oakland)—To develop six mining claims near Omo.

Humboldt County

CHROME SHIPMENTS from Eureka in the first half of July amounted to six carloads; five were brought down from Del Norte County by water; one carload was brought in from the Pecwan Creek mines in the northern border of Humboldt County. The first carload mined at Horse Mountain has been hauled by motor truck to Korbel for rail shipment from Essex.

MANGANESE SHIPMENTS by rail from points nearest to the mines have been in progress for several weeks. Two carloads were shipped in the first half of July from Fort Baker mines via Carlotta on the Northwestern Pacific. Regular shipments being made from mines in Fort Seward region, the Doak mines being the principal producers.

Napa County

CORONA QUICKSILVER (Napa) — Negotiations for sale of property being considered by directors. If deal is made, new development to be by tunnel driven for drainage and the possibility of opening up new orebodies.

Nevada County

ALLISON RANCH (Grass Valley) — Shaft unwatered to No. 9 level and unwatering proceeding in drifts. Development to follow.

EMPIRE (Grass Valley)—Construction of electric railway from Empire mill to Pennsylvania mine nearing completion.

Placer County

LIBERTY HILL (Dutch Flat)—Building large restraining dam in preparation for hydraulicking.

WISCONSIN (Dutch Flat) — Recent equipment of small stamp mill earning profit.

Plumas County

MANGANESE SHIPMENTS from Crescent Mills region started by Noble Electric Steel Co. to smeltery at Heroult, Shasta County.

MANGANESE DEPOSIT on Mount Hough being developed by Smith brothers, of Nevada City. Shipments have started.

JUNEDAY (Crescent Mills)—Recently equipped with electric power, compressor and machine drills.

San Bernardino County

ATOLIA (Atolia) — Company expects to show large production this year. Other tungsten mines and prospects in the Atolia and Randsburg district are active. More than 20% of the tungsten produced in this country comes from these two districts.

San Luis Obispo County

MANGANESE DEPOSITS have been discovered near Atascadero, in serpentine formation near belt of jasper traversing the district.

CHROME CLAIMS on Thompson Reid ranch leased by Charles Seeley. Development to be undertaken soon.

COLORADO

Boulder County

GOLDEN AGE (Springdale)—Ore being delivered to mill by 3½-ton Bethlehem truck doing the work of three teams, and operating satisfactorily over steep mountain grades.

EVANS (Summerville)—High-grade silver ore opened up by Nicholls brothers.

VICTORIA (Summerville)—Silver ore opened up by development work under direction of F. M. Pickard.

Clear Creek County

COLORADO CENTRAL (Georgetown)—Begun operation of concentration plant and will ship to smelteries.

TERRIBLE (Georgetown)—Making regular shipments of lead ore carrying silver.

Teller County

INDEX (Cripple Creek)—Lessees shipping ore from 700 and 900 level. Shaft to be sunk to 1100 level and station cut.

IDAHO

Boise County

NATIONAL (Placerville)—Repairs to mill completed. To mine ore on 800 level and sink winze from 1500 level.

Shoshone County

CONSOLIDATED INTERSTATE-CALAHAN (Wallace)—Resumed operation of mill Aug. 1.

SENATOR (Wallace)—Hard ground delaying drift being driven for vein.

EAST CALEDONIA (Wardner)—Has suspended operations until more favorable conditions obtain.

KANSAS

Joplin District

CHILTO LEAD (Baxter Springs)—To build 250-ton mill; needs sludge tables, compressors, belts and crushers.

GRAHAM-VAN DYKE (Baxter)—Sinking two shafts on Cooper land. Plan building mill.

QUAKER VALLEY (Baxter)—Operating new mill six miles northeast of Baxter. Adam Scott, of Joplin, is superintendent.

CRESCENT (Miami)—Pushing work on Blue Rock 250-ton mill, on lease southwest of Waco, Mo. Plant to be ready in 60 days. L. E. Smith, of Kansas City, is president.

EARLY BIRD (Miami)—New mill now in regular operation.

SOUTHERN (Miami)—Operating mill one shift. Mining at 222 ft. and still above best ore deposits.

ELOOSA LEAD AND ZINC (Treece)—To build 300-ton mill and requires tables, engine, boiler compressors and ore cars.

LAWYERS (Treece)—To build 250-ton mill and expected to purchase sludge and slime tables, crushers, boilers, drills, ore cars and track. George O. Pearson is superintendent.

MIAMI-TEXAS (Treece)—To remodel 250-ton mill and expect to purchase tables, compressors, conveyors, ore cars and track.

MICHIGAN

Copper District

BEAR LAKE—(Calumet)—New machinery ready soon.

FRANKLIN (Demmon)—Starting drift on 1900 level of No. 2 shaft.

HANCOCK (Hancock)—Two new lodes opened carrying good average copper.

AHMEEK (Kearsarge)—Fire at shafts No. 3 and No. 4 continues to burn. Shafts have been sealed, and men are employed at other shafts.

WINONA (Winona)—Drift on 1500 level is 200 ft. from No. 4 shaft. To raise to 1400 level.

MINNESOTA

Mesabi Range

STATE MINE SHIPMENTS made a record during week ended July 21, when 204,411 tons was shipped. Missabe Mountain shipped 36,912 tons and Leonidas, 21,000 tons.

DEAN (Chisholm)—Todd-Stambaugh interests have leased two forties south of Hartley mine and are sinking shaft. Charles H. Claypool is superintendent.

SNYDER (Nashwauk)—Check drilling being done by Todd-Stambaugh interests.

MISSOURI

Joplin District

GRANBY CONSOLIDATED (Granby)—Building two mills at an estimated cost of $130,000. Need but have not purchased tables, motors, compressors, tracks, boilers and engines.

BADGER (Joplin) — Building 250-ton mill; to purchase sludge and slime tables, engine, boilers, crushers and ore cars. A. Foster is manager.

BUTTE-KANSAS (Joplin)—Both shafts being sunk to deeper level at new property. Steady operation maintained at Acme mine.

CREEK (Joplin)—Shaft in ore on Culbert lease at Four Corners. L. W. Vidler is manager.

A. F. HOLT (Oronogo)—Building 200-ton mill to replace one destroyed by fire. In the market for sludge and slime tables, compressors, drills and crushers.

MT. NEBO (Seneca)—Building 200-ton mill; to purchase sludge and slime tables, crushers, conveyors, air compressors, boilers and engines.

CENTRAL ZINC (Waco)—Remodeling 400-ton mill and expects to purchase tables, compressors, boilers, crushers, cars and track. Frank Danglade is superintendent.

CRESCENT (Waco)—Building 250-ton mill and will purchase gas engine, crushers, rolls, tables and jigs. Glen Smith is superintendent.

MIAMI-WACO (Waco)—To build 250-ton mill; requires crushers, compressors, drills and sludge and slime tables. W. P. Cunningham is superintendent.

MONTANA

Lewis and Clark County

CRUSE CONSOLIDATED (Helena)—Sinking below 300-level at Helena mine.

MONTANA MANGANESE - SILVER (Helena)—Operating Far West group of claims in Skelly district. Shipping ore to East Helena smeltery.

NEVADA

Clark County

SULTANA (Goodsprings) — To be reopened; hoisting equipment and air compressor being overhauled. Mine owned and operated by Henry Robbins.

Elko County

GOVERNMENT OIL-SHALE TESTING PLANT to be built soon at Elko. Stated appropriation of $60,000 made for this purpose. May build plant on oil-shale land near Catlin interests.

Humboldt County

ROCHESTER COMBINED (Rochester)—Drifting both ways on vein and stoping in Magazine tunnel. New ventilating equipment installed in main tunnel, and raising being done. Ore bins at mill to be filled before motors are received and installed. Electric locomotive to be installed in main tunnel for ore haulage.

Lyon County

BLUESTONE MINING AND SMELTING (Yerington)—Fire recently destroyed assay office. Loss of building slight, but equipment and supplies of considerable value. Several cottages for employees to be built, and other improvements made.

NORTHERN LIGHT (Yerington)—Development under way. Small shipments of copper ore made.

Mineral County

LUCKY BOY (Hawthorne)—To be reopened soon, and if sufficient milling grade ore is developed, a flotation unit will be installed.

SILVER DYKE (Mina)—To build 30-ton mill to concentrate high-grade scheelite ore.

Nye County

BIG PINE (Manhattan)—Resumed milling of oversize ore dump after delay of few days.

JEFFERSON CANYON (Manhattan)—Operating old Kanhorat property under management of S. H. Brady. Mill being overhauled and changes made to increase capacity.

MANHATTAN CONSOLIDATED (Manhattan)—Raise on east orebody from fifth level to be extended from point where ore was first exposed in south crosscut.

UNION AMALGAMATED (Manhattan)—Station on bottom level completed.

WHITE CAPS (Manhattan)—Raise from fourth level is expected to connect with shaft orebody.

TONOPAH DISTRICT ore production for the week ended July 20 totalled 10,237 tons, of an estimated gross milling return of $174,029. Producers were: Tonopah Belmont, 2101 tons; Tonopah Mining, 3600; Tonopah Extension, 2389; Jim Butler, 353; West End, 1143; Halifax, 58; Montana, 238; MacNamara, 315 and Cash Boy, 40 tons.

"SLIME FARMERS" in Tonopah district have suffered heavy loss on account of recent rains. Work of these men consists in carefully leveling off tailings dumps of milling plants, and loosening surface lightly with disk harrows. Capillary attraction causes contained cyanide solution to come to surface, where it is evaporated by sun. Thin layer is periodically swept off top of dumps or ponds, which has been greatly concentrated. Stated that $15,000 to $20,000 is collected every season in Tonopah district by this method. Recent heavy rains have spoiled two or three months' work, and operation must be repeated.

JIM BUTLER TONOPAH (Tonopah)—Receipts for ore shipped during six months ended June 30 were $294,353.70; operating expenses, $131,708.61 and net earnings, $162,645.09. Total net income amounted to $169,527.69.

TONOPAH EXTENSION (Tonopah)—Receipts from mine and mill operation during June were $152,257.54; current expenses, $85,116.91; leaving an operating profit of $67,140.63.

Storey County

UNWATERING OPERATIONS at North End mines progressing steadily. New high-tension power line installed, giving more dependable power service. Unwatering Andes shaft under way and extensive development planned. New pumps to be installed in Combination shaft and unwatering pushed.

CONSOLIDATED VIRGINIA (Virginia City)—Developing on 2100 level. Considerable tonnage produced from 2000 and 2200 levels.

MEXICAN (Virginia City)—High-grade quartz opened on 2300-ft. level by winze. Drifting to be done soon. Deeper development work planned.

SIERRA NEVADA (Virginia City)—Raise from 2500 level continues to open ore.

UNION CONSOLIDATED (Virginia City)—Long drift on 2600 ft. level opening good-grade ore; drift to be continued to Union vein. Good ore being produced on 2200, 2300 and 2400 levels.

Washoe County

EXPERIMENTAL OIL-SHALE PLANT at University of Nevada, Reno, operating successfully. Shut down temporarily to make minor changes. Alexander M. Boyle is engineer in charge.

NEW MEXICO

Grant County

EIGHTY-FIVE (Lordsburg)—A 300-ton concentrator has been designed and completed by J. W. Crowdus, of El Paso.

LAST CHANCE (Lordsburg)—To begin installing machinery Aug. 1st.

LORDSBURG GOLD AND COPPER (Lordsburg)—To sink 300-ft. shaft and will require power and hoisting equipment. E. L. Armstrong is superintendent.

McGEE BROS. (Steins)—Sinking shaft. Plan to purchase 600-ft. belt-driven compressor.

WATERLOO (Tres Hermanos)—Main shaft down 100 ft. To sink additional 100 ft. and drift 300 ft. Vein is 10 ft. wide and carries lead and silver. Concentrator to be built.

OKLAHOMA

Joplin District

BIG JIM (Commerce)—To build 200-ton mill. Construction to start Aug. 15. Will need tables, engine, crushers, compressors, jigs and conveyors. G. W. Nesmith is superintendent.

LONE STAR (Hockerville)—To build 300-ton mill. Construction to start Aug. 10 and will purchase crushers, belts, drills and compressor. B. F. Madden is superintendent.

DEVELOPMENT (Lawton)—Remodeling 250-ton mill and increasing capacity to 500 tons. Will require tables, compressors, crushers and ore cars. E. E. Jayne is manager.

HIDDEN TREASURE (Picher)—New shaft ore at 265 feet.

VANTAGE (Picher)—Operating after shut-down due to lack of water.

LEAD CAVE (Quapaw)—Remodeling 200-ton mill and expect to purchase tables, belts, cables and ore cars.

McCURDY (Quapaw)—To operate mill soon.

RED ROSE (Quapaw)—Started new concentrating plant on a lease northeast of Quapaw.

MAXINE (Tar River)—Constructing 400-ton mill; to purchase crushers, compressors, belts and tables. W. C. Miller is superintendent.

OREGON

Baker County

AZURITE (Homestead) — Considerable zinc-lead-silver-copper ore blocked out. Difficulty of effective separation has retarded development. Property under bond to Bills Mining Co. controlled by Aleck Bills, Harry Gilchrist and E. W. Bain. Milling equipment, including rockbreaker and 5-compartment Joplin jig, being installed. Operators plan to make marketable zinc product and to store tailings for future treatment. More equipment to be added if present installation proves satisfactory.

BLUEBELL (Homestead)—Old tunnels being cleaned out, and contract has been let to Diamond Drill Contracting Co., of Spokane, for extensive drilling.

IRON DYKE (Homestead)—Shipping copper concentrates regularly and operating 125-ton flotation plant. Electric storm on July 11 burned out two motors. Present output below normal, on account of labor shortage.

RAND-McCARTY (Homestead) — Oxidized ore has been found in the upper workings, and tunnel being driven to cut lode below water level.

RIVER QUEEN (Homestead)—Operated by F. Alers under lease from Haas brothers. Seven cars of good copper ore have been shipped.

UTAH

Beaver County

MAJESTIC (Milford)—Shaft at Old Hickory to be sunk to 500 ft. before prospecting is started.

Juab County

TINTIC SHIPMENTS for week ended July 20 amounted to 172 cars.

MAY DAY (Eureka)—Company operating on 700 level, and lessees in several other places.

UNCLE SAM (Eureka)—To be worked by lessees.

ZUMA (Eureka) — Improvements to equipment made and sinking of winze from 500 level resumed.

IRON BLOSSOM (Silver City)—Accident to shaft during week ended July 20 retarded shipments, but mining was carried on as usual and ore stocked underground.

Piute County

ATLAS PRODUCT (Marysvale)—Company recently organized to exploit alunite-bearing claims, six miles from Marysvale.

San Juan County

BIG INDIAN COPPER (Lasal)—New 200-ton mill to treat copper ore being warmed up.

NEW FIND OF URANIUM ORE reported at Wray Mesa southwest of the Paradox section, and not far from San Juan.

Tooele County

DEVELOPMENT OF DEEP CREEK DISTRICT through operation of new railroad justifies improvements to town of Goodwin, formerly Gold Hill, terminus of the railroad, and through coöperation of various companies interested town water-system is to be installed and first-aid hospital established.

WESTERN UTAH EXTENSION (Goodwin)—Ore carrying copper-silver and gold opened on 200 level, and extension of find being sought on 300 level. Manganese ore being developed at Helmet mine.

BELCHER (Tooele)—To install Forrester grinder and 50-ton Dykes concentrating plant.

WASHINGTON

Thurston County

SPOKANE TIN AND TUNGSTEN (Olympia)—Incorporated by F. C. Bailey, F. A. Ross, J. M. Fitzpatrick, E. E. McClintock, A. K. Booth, of Spokane, and O. T. Lathrop, of Lethbridge, Alberta. To develop a property near Kiesling.

CANADA

Ontario

NEWRAY (Porcupine)—Arrangements completed with the Northern Ontario Light and Power Co. for construction of transmission line to supply power to mine.

NORTH DAVIDSON (Porcupine)—Fifth drill hole being started. Two previous holes show good gold content.

PLENAURUM (Porcupine)—To diamond drill from 1000 level.

PORCUPINE CROWN (Porcupine) — Supplies being sold and mine to be closed.

WEST DOME (Porcupine)—To close down.

CHAMBERS-FERLAND (Cobalt)—No. 2 shaft being dewatered for resumption of operations.

McKINLEY-DARRAGH (Cobalt) — To reopen Savage property an account of high price of silver.

PENN-CANADIAN (Cobalt)—Has option on Indian-Peninsula molybdenum mine. To install 30-ton mill.

PETERSON LAKE (Cobalt)—Mill closed temporarily. Changes to increase its capacity in progress.

SAVAGE (Cobalt)—Three machines employed to secure milling rock.

THREE STAR (Cobalt)—Work resumed on property (formerly Calumet & Montana). Vein carrying low silver content to be developed.

BURNSIDE (Kirkland Lake) — Shaft down 252 ft. to be sunk 400 feet.

KIRKLAND LAKE GOLD (Kirkland Lake)—Mill expected to be in operation by fall. Practically all machinery is on the ground.

OTISSE (Matachewan)—Exploration being pushed by Ontario-Colorado Development Co. To install another diamond drill and explore at depth.

MILLER INDEPENDENCE (Boston Creek)—Rich ore found in shaft on vein at 100 feet.

BOURKES (Bourkes Station)—Shaft down 35 ft. to be continued to 100 level.

EBY SYNDICATE (Lawson Township)—Deposit of barite discovered.

WHITE RESERVE (Maple Mountain)—Crosscutting at 140 level was opened up. Veins carrying cobalt, niccolite and traces of native silver.

FIDELITY (Skead Township)—Shaft sunk 20 ft. on gold-silver vein.

Quebec

INDIAN PENINSULA (Amos)—Penn-Canadian Mining Co., of Cobalt, has obtained controlling interest. Preparing to install first unit of 100-ton mill to treat molybdenum ore with Groch flotation system. Balmer Neilly is manager.

MEXICO

Baja California

COMPAGNIE DU BOLEO (Santa Rosalia)—Copper production during June was 1,322,720 lb. Copper ore averaged 3.24% copper.

The Market Report

SILVER AND STERLING EXCHANGE

Aug.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Aug.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
1	4.7530	99⅛	48 11/16	5	...	99⅛	....
2	4.7530	99⅛	48 11/16	6	4.7530	99⅛	48 11/16
3	4.7530	99⅛	48 11/16	7	4.7530	99⅛	48 11/16

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Aug.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
1	*26	†	8.05	7.75	7.90 @7.95
2	*26	†	8.05	7.75	7.92½ @7.97½
3	*26	†	8.05	7.75	7.95 @8.05
5	*26	†	8.05	7.75	8.05 @8.10
6	*26	†	8.05	7.75	8.07½ @8.12½
7	*26	†	8.05	7.75	8.07½ @8.12½

*Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

Aug.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
1	122	122	137	394½	394½	29½	28½	54
2	122	122	137	399	399	29½	28½	54
3	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...
6	122	122	137	399	399	29½	28½	54
7	122	122	137	399	399	29½	28½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.21212 05c.

Metal Markets

NEW YORK, Aug. 7, 1918

The metal markets have gradually worked into such a state of chaos and despair, resulting from the meddling of the War Industries Board, that there is a feeling that things cannot be any worse. Zinc and antimony have been immune, for the high prices prevailing for them before our entry into the war produced an ample supply, but of copper, lead and tin there is not enough, and with such a situation the official mind is to discourage production, without any thought of the benefit there might be in trying stimulation.

Copper—Both this week and last week were rather eventful, owing to conferences between the producers and officials of the War Industries Board. Last week there were conferences on the subject of adjusting contracts and pending business that were disturbed by the sudden and unexpected raising of the price to 26c. on July 2. It is no longer any secret that some departments of the Government tried to saddle such contracts upon the producers that the advanced price would not have helped the latter, any way not until after Aug. 15; while to some concerns very serious harm would have resulted. This question had been adjusted, but not very satisfactorily to the producers. Manufacturers, i.e., wire drawers, sheet rollers, etc., who entered into contracts following the original prolongation of the 23½c. price to Aug. 15, have their own grievance. This has not yet been adjusted at all. The whole business is a deplorable muddle, and conversations about it have not been wholly amicable.

On Aug. 6 the "high-cost producers" met the War Industries Board, to plead for special recognition, and received the answer that there would be no discrimination as to price among producers. This decision was, of course, wise. There could scarcely be anything more productive of further chaos than the making of two prices for the same commodity.

On Aug. 7 all of the producers met with the price-fixing committee to consider the agreement subsequent to Aug. 15. The result of this conference was that the 26c. price is to be continued until Nov. 1. This has not yet been approved by the President, and there will be no official announcement until after the approval of the President.

Copper Sheets are not quoted, as there is a wide diversity in prices of different dealers. Copper wire is quoted at 29 to 30c. per lb. f.o.b. mill, carload lots, subject to any change in the price of copper.

Tin—There is nothing worth mentioning done in this market. Singapore quoted £390½, c.i.f., London, for Straits tin on Aug. 1; £394½ on Aug. 2; £406, on Aug. 6; and £404, on Aug. 7.

Mr. Armsby, head of the Tin Division of the War Industries Board; John Hughes, representing the American Iron and Steel Institute, and one other have gone to London as a tin commission, evidently for the purpose of talking over the tin situation. Consumers here think that the price of tin is going to be regulated downward, and therefore are minded to defer their buying There is something humorous in the idea of fixing a price at a reduced level in a market which is in despair owing to short supply of the commodity.

Lead—The situation is unchanged. Supplies continue scarce, with no immediate prospect of becoming easier. Japan inquired for further tonnages of lead, but its inquiries are useless.

Zinc—The market was weaker in the early part of the week on offerings by some of the smaller Western producers, but when it was ascertained that the Government was going to invite tenders for 3000 tons of Prime Western spelter, for delivery between now and the end of the year, the market stiffened. However, it was a dull and uninteresting affair throughout the week. An inquiry for export, presumably to Japan, was an interesting feature. During recent weeks Japan has bought some small tonnages, both of refined spelter and common.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Price fixed at 33c. per lb. for lots of 50 tons or more, ingot, 98-99% grade. Sheets are 42c. per lb. for 18 gage and heavier. Price established June 1 and continues to Sept. 1.

Antimony—Spot was quoted at 13@13¼c. The market is steady but not much business was done. We quote futures at 12c., c.i.f., in bond.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted $1.50@1.75 per pound.

Nickel—Market quotation is 40@45c. per pound.

Quicksilver—Steady at $125. San Francisco reports, by telegraph, $117.50, firm.

Silver and Platinum

Silver—Quotations remain unchanged but owing to the rise in China exchange rates it is profitable to export sliver to China and pay over the government price of $1 per oz. Considerable business is being done for China account at prices over $1 per oz., with the result that neither the U. S. nor the British government is able to buy silver for its war needs.

Mexican dollars at New York: Aug. 1, 77; Aug. 2, 77; Aug. 3, 77; Aug. 5, 77; Aug. 6, 77; Aug. 7, 77.

Platinum, Palladium and Iridium—Prices fixed at $105, $135 and 175, respectively. There may be clandestine business at higher prices.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 3—Blende, per ton, high, $77.50; basis 60% zinc, premium, $75; Class B, $65@60; Prime Western, $47.50@42.50; calamine, basis 40% zinc, $37.50@30. Average selling prices: blende, $57.83; calamine, $36.08; all ores, $56.40.

Lead, high, $103.20; basis 80% lead, $100; average selling price, all grades of lead, $98.80 per ton.

Shipments the week: Blende, 9466; calamine, 661, lead, 1693 tons. Value, all ores the week, $738,530.

The large purchases of Class B grades of ore advanced the average price in the face of a declining market. The lower prices of last and this week will figure more largely in next week's settlement prices.

Producers who have been holding lead expecting it to go higher, seem to have received a tip to the contrary, and some are letting it go on the $100 basis. The car situation was easier this week, and buyers were able to ship more of their ore.

Platteville, Wis., Aug. 3.—Blende, basis 60% zinc, highest price reported paid for premium grade was $75 to $80 per ton; high lead blende, base $52 per ton; lead ore, basis 80% lead, $93 per ton base.

Shipments reported for the week were 1849 tons blende, 120 tons galena, and 546 tons sulphur ore. For the year to date the totals are 77,157 tons blende, 4360 tons galena, and 30,350 tons sulphur ore. During the week 2911 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Charles Hardy reports that business was done at $1.70 per unit for 50% ore in large quantities.

Manganese Ore—Unchanged.

Molybdenum Ore—Quoted nominally at $1 per lb. of molybdenum sulphide in ore containing 90% or over.

Tungsten—The market continues active, $24 being paid for high-grade ore free from all impurities; $20 to $23.50 for ores containing small amounts of impurity. The scarcity of high-grade ores indicates the continuence of or even an advance upon present prices.

Other Minerals

Pyrites—Spanish lump is quotable to those who possess a license from the Government at 17c. per unit on the basis of 9s. ocean freight, buyer to pay war risk, less 2% and excess freight. Tonnage is extremely difficult to obtain. Domestic pyrites is selling at a price of 25c. per unit, f.o.b. mine, according to delivery basis. Some mines in the South are reporting prices as 34c. per unit for lump and 32c. per unit for fines, f.o.b. mines.

Iron Trade Review

PITTSBURGH—Aug. 6

The extremely hot weather of the last few days has operated to curtail iron and steel production somewhat, but not as much as in previous seasons. Superintendents, foremen and men are striving to maintain production. Records of July outputs that are available show decreases in some cases and increases in others, as compared with June, and it is certain there has been little total decrease, if any. With the passing of hot weather still larger outputs are in prospect. However, the war requirements are increasing so that the possibility of adding to capacity is being hurriedly but thoroughly canvassed, and it is probable that formal announcement will be made in the near future that capacity is to be increased. The program would involve more additions to blast furnace than to openhearth capacity. Supplies of pig iron now are approximately adequate to the steel-mill requirements, but the heavy demands from abroad can hardly be met in addition.

The War Industries Board adheres to its estimate of 20,000,000 net tons of steel required for the present half year, and has now placed an estimate that at least 20,000,000 tons will be required for the first half of next year. Shipbuilding is to take more than expected, and the shell program is being enlarged, calling for 500,000 net tons or more per month for the remainder of this year.

Some of the mills are able to do fairly well by the jobbers this month, shipping them, according to the recent permission of the War Industries Board, an amount of steel equal to the average shipments in the first half of this year. Other mills, and they constitute the majority, find they cannot supply the material having orders with a priority higher than B-4, which will absorb their output. It is believed that in the majority of cases the jobbers have fair-sized stocks.

Pig Iron—Nothing definite has been given out as to plans being considered for aiding the high-cost merchant furnaces in Tennessee and Virginia, whose costs are much closer the set selling prices than is the case with furnaces in other districts. On an average, merchant furnace profits are entirely satisfactory. In the last two or three weeks there has been some selling by a few interests for the first half of 1919, but only to regular customers, engaged in recognized essential work. Even this business is not altogether approved at Washington. Orders for early deliveries are rarely placed except through the medium of allocations first secured, the prospective consumer placing his case before the pig-iron representative of the War Industries Board, upon whose approval the civilian committee makes an allocation upon the furnace best fitted to furnish the iron. There is no particular shortage of iron for domestic consumption, though somewhat larger supplies could be used at a few points, but there is a serious shortage when the requirements of Britain, France and Italy are considered, and some recent calls from such quarters have scarcely been met, even with the greatest effort so to do. The market remains quotable at the set limits: Bessemer, $35.20; basic, $32; No. 2 foundry, $33; malleable, $33.50; forge, $32, f.o.b. furnace, freight from the Valleys to Pittsburgh being $1.40 and from half a dozen detached furnaces somewhat less. W. P. Snyder & Co. announce the average prices obtaining in sales during July at the set limits $35.20 for bessemer and $32 for basic. Foundry iron during the month also ruled at the set price.

Steel—Several of the steel mills would buy ingots or billets if they could be obtained, but all surplus steel is already marketed. There is scarcely any shell-discard steel to be had, the War Industries Board having found outlets for nearly all that is produced, in the filling of direct war orders. The market for soft remains quotable at the set limits: Billets, $47.50; sheet bars and small billets, $51; slabs, $50; wire rods, $57.

Ferroalloys

Ferromanganese—Demand is rather light for both ferromanganese and spiegeleisen, and consumers appear to have fair stocks. With the conservation that is in vogue, it is now thought necessary requirements will be met indefinitely. Ferromanganese is quoted at $250, delivered, for 70%, with $4 a unit for additional manganese, and spiegeleisen at $75, furnace, for 16 to 18 per cent.

Coke—Output of coke in the Connellsville region continues at a trifle above 350,000 tons per month. Byproduct coke production continues to increase almost weekly. One-half of the new Lorain plant, which totals 208 ovens, is in operation, and the remaining ovens may be completed in about 30 days. At the Clairton plant the first battery, 128 ovens, is in full operation, and the three Clairton furnaces, 450 tons' daily capacity each, are operating exclusively on this coke. The second battery will be completed in about a month.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407		31.498	43.418	
Sept.	68.515	100.740		32.584	50.920	
Oct.	67.855	87.332		32.361	44.324	
Nov.	71.604	85.891		34.192	43.584	
Dec.	75.765	85.960		36.410	43.052	
Year	65.661	81.417		31.315	40.851	

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380		122.391		137.000	
Sept.	25.073		117.500		135.250	
Oct.	23.500		110.000		125.000	
Nov.	23.500		110.000		125.000	
Dec.	23.500		110.000		125.000	
Year	27.180		124.892		138.401	

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681		243.978	
September	61.542		244.038	
October	61.851		247.467	
November	74.740		274.943	
December	87.120		298.556	
Av. year	61.802		237.563	

(a) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594		10.518		30.500	
September	8.680		8.611		30.500	
October	6.710		6.650		30.500	
November	6.249		6.187		30.500	
December	6.375		6.312		30.500	
Year	8.787		8.721		30.500	

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.373	8.473	8.338	54.000	54.000
August	8.360		8.190		54.000	
September	8.136		7.966		54.000	
October	7.983		7.813		54.000	
November	7.847		7.672		54.000	
December	7.685		7.510		54.000	
Year	8.901		8.813		52.413	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17		50.37		53.95	
September	46.40		42.24		48.58	
October	37.25		33.95		33.95	
November	37.25		33.95		33.95	
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.† Aug. 6	
Alaska Gold M.	3⅛
Alaska Juneau	2⅛
Am.Sm.& Ref.,com.	78⅛
Am. Sm. & Ref., pf.	106⅛
Am. Sm. Sec., pf., A	89
Am. Zinc	18⅛
Am. Zinc, pf.	49⅛
Anaconda	66⅛
Batopilas Min	1⅛
Bethlehem Steel	84
Bethlehem Steel, pf.	‡88⅛
Butte & Superior	27⅛
Butte Cop. & Zinc	11
Cerro de Pasco	34
Chile Cop.	16⅛
Chino	39⅛
Colo. Fuel & Iron	46⅛
Crucible Steel	66⅛
Crucible Steel, pf.	91⅛
Dome Mines	8⅛
Federal M. & S.	10⅛
Federal M. & S., pf.	33
Great Nor., ore ctf.	31⅛
Greene Cananea	45
Gulf States Steel	81⅛
Homestake	71
Inspiration Con.	52⅛
International Nickel	30⅛
Kennecott	34
Lackawanna Steel	83
Mexican Petrol	101⅛
Miami Copper	28
Nat'l Lead, com.	58⅛
National Lead, pf.	102⅛
Nev. Consol.	20
Ontario Min	9⅛
Ray Con	23⅛
Republic I.&S.,com.	91⅛
Republic I. & S., pf.	100
Sloss-Sheffield	61
Tennessee C. & C.	19⅛
U. S. Steel, com.	109⅛
U. S. Steel, pf.	110⅛
Utah Copper	81⅛
Va. Iron C. & C.	72

BOSTON CURB* Aug. 6	
Alaska Mines Corp.	.12
Boston Ely	.70
Boston & Mont.	.51
Butte & Lon'n Dev.	.13
Calaveras	.50
Calumet-Corbin	‡.01
Chief Con.	2⅛
Cortez	.07
Crown Reserve	.18
Crystal Cop.	.32
Eagle & Blue Bell	2⅛
Gila Copper	‡17
Houghton Copper	.50
Intermountain	‡.05
Iron Cap	18⅛
Mexican Metals	.43
Mines of America	1⅛
Mojave Tungsten	.10
Nat. Zinc & Lead	.15
Nevada-Douglas	.52
New Baltic	.84
New Cornelia	18⅛
Oneco	.20
Pacific Mines	‡.35
Rex Cons	.07
Yukon Gold	1

SAN FRAN.* Aug. 6	
Alta	.03
Andes	.05
Best & Belcher	.03
Caledonia	‡.03
Challenge Con.	.03
Confidence	.04
Con. Virginia	.22
Gould & Curry	.01
Hale & Norcross	‡.01
Jacket-Cr. Pt.	.07
Mexican	.17
Occidental	‡.51
Ophir	.06
Overman	.02
Savage	.03
Sierra Nevada	.03
Union Con.	.41
Utah Con.	.01
Belmont	2.75
Jim Butler	.58
MacNamara	.31
Midway	.04
Mont.-Tonopah	.09
North Star	.08
Rescue Eula	.09
West End Con.	1.05
Atlanta	.03
Booth	.04
Comb. Frac	‡.02
Florence	.10
Jumbo Extension	.08
Kewanas	.03
Nevada Hills	.01
Nevada Packard	.27
Round Mountain	.18
Silver Pick	.04
White Caps	‡.30
Big Jim	‡.75
United Eastern	3.50

COLO. SPRINGS* Aug. 6	
Cresson Con.	4.75
Doctor Jack Pot	.04⅛
Elkton Con.	.04⅛
El Paso	.10
Gold Sovereign	‡.02
Golden Cycle	1.65
Granite	.19
Isabella	.04⅛
Mary McKinney	.08
Portland	‡.80
United Gold M.	.14
Vindicator	.43

BOSTON EXCH.* Aug. 6	
Adventure	.60
Ahmeek	76⅛
Algomah	‡.15
Alloues	.50
Ariz. Com., ctfs.	15
Arnold	.20
Bingham Mines	9⅛
Bonanza	.15
Butte-Balaklava	.25
Calumet & Ariz.	67
Calumet & Hecla	458
Centennial	12⅛
Copper Range	48
Daly West	2⅛
Davis-Daly	5⅛
East Butte	10⅛
Franklin	4⅛
Granby	79⅛
Hancock	6
Hedley	‡12
Helvetia	.15
Indiana	‡.40
Isle Royale	26
Keweenaw	1
Lake	5⅛
La Salle	2⅛
Mason Valley	3⅛
Mass	5
Mayflower	2⅛
Michigan	2⅛
Mohawk	56
New Arcadian	1⅛
New Idria	14
North Butte	14
North Lake	.60
Ojibway	.50
Old Dominion	42
Osceola	52
Quincy	68⅛
St. Mary's M. L.	50
Santa Fe	.63
Seneca	11
Shannon	3⅛
Shattuck-Ariz.	16
So. Lake	1
So. Utah	.13
Superior	5
Superior & Bost.	2⅛
Trinity	3
Tuolumne	1⅛
U. S. Smelting	42⅛
U. S. Smelt'g, pf.	43⅛
Utah Apex	1⅛
Utah Con.	10
Utah Metal	2
Victoria	2⅛
Winona	1⅛
Wolverine	26⅛
Wyandot	.50

N. Y. CURB† Aug. 6	
Big Ledge	1
Butte & N. Y.	‡.75
Butte Detroit	.14
Caledonia	.48
Calumet & Jerome	1
Can. Cop. Corpn.	‡1
Carlisle	.22
Cashboy	.06
Con. Ariz. Sm.	1⅛
Con. Coppermines	4⅛
Con. Nev.-Utah	‡
Emma Con.	‡.10
First Nat. Cop.	2
Goldfield Con.	‡.24
Goldfield Merger	.03
Greenmonster	‡
Hecla Min.	4⅛
Howe Sound	‡4⅛
Jerome Verde	‡
Kerr Lake	5.65
Louisiana	
Magma	‡32
Majestic	‡.18
Marsh	‡.05
McKinley-Dar-Sa.	.38
Milford	‡.75
Mohican	‡.06
Mother Lode	.36
N. Y. & Hond.	‡12⅛
Nipissing Mines	8⅛
Nixon Nevada	.43
Ohio Cop.	‡1
Rawley	‡2⅛
Ray Hercules	4⅛
Richmond	‡.56
Rochester Mines	.37
St. Joseph Lead	14⅛
Standard S. L.	
Stewart	.13
Success	.12
Tonopah	2⅛
Tonopah Ex.	1⅛
Tribullion	‡
Troy Arizona	.12
United Cop.	‡
United Verde Ext.	37⅛
United Zinc	‡1⅛
Utica Mines	‡.08

TORONTO* Aug. 6	
Adanac	.07
Bailey	.02
Beaver Con.	.23
Chambers Ferland	.12
Coniagas	2.50
Hargraves	.04
La Rose	.35
Peterson Lake	.09
Temiskaming	.30
Wettlaufer-Lor.	.04
Davidson	.22
Dome Exten.	.09
Dome Lake	.12
Hollinger	4.50
McIntyre	1.32
Newray	.13
Porcu. Crown	.11
Teck-Hughes	.10
Vipond	.11
West Dome	.09

* Bid prices. † Closing prices. ‡ Last Quotations.